the OIL AND GAS JOURNAL

APRIL 22, 1957

Mechanized PIPELINE WELDING

No preheating . . . No stringer bead . . .
No space between joints . . .

PAGE 104

"SHOWPIECE" REFINERY HAS NO PIPELINE CONNECTION

. . . and 80 per cent of Amoco's workers are new to the industry

p. 82

STRAT TRAPS LURE INDEPENDENTS TO ILLINOIS

. . . They like the shallow depths, low drilling hazards, rapid payout

p. 177

WHAT'S HE DOING?

The man lubricating the Rockwell-Nordstrom valves in the photo above is doing a number of things you can't do with ordinary valves. Here's what he's accomplishing with one, easy, simple operation:

CUTTING COSTS: Lubrication pennies save maintenance dollars. By stopping metal-to-metal friction, lubrication is an investment in longer valve life at lower cost.

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The performance and economy of Rockwell-Nordstrom lubricated plug valves has been proved in refineries and natural gasoline plants all over the world. They are available in a full range of sizes and pressure ratings to meet your every need. And they cost no more to buy, often less, than ordinary valves. For details, see your supplier or write: Rockwell Manufacturing Co., Pittsburgh 8, Pa. *Canadian Valve Licensee:* Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-Off

JOURNAL News Letter

April 22, 1957
Tulsa, Oklahoma

Reports trickling in on first-quarter oil profits look good:

It's too early to spot a trend--too few oil companies have reported. But those who have show good profit gains over the first quarter of last year. And all express confidence that 1957 will be a good year for the industry.

One company report showed an 18-cent per share profit gain over this period of 1956. Another recorded an 18 per cent increase, and a third 9 per cent. A fourth statement merely termed the profit picture a "healthy improvement." In each case the healthier outlook was attributed to higher crude prices.

Another encouraging factor also popped up last week. It made oil men generally hope the drilling picture is taking a turn for the better. Reports showed 102 more rotary rigs active than the week before. The drilling segment of the industry has been in the doldrums throughout the first quarter. Higher earnings from crude production, however, are expected to be reflected in greater expenditures for drilling the rest of the year.

Although management may be happy about the first quarter, many officials privately express concern about crude and product prices the rest of the year. Here's why: Gasoline prices right now are sloppy in many sections... Price of Middle East crude, now beginning to move again in volume, has not been increased.

Many feel that Middle East crude prices eventually will move up to match the higher prices posted in the U.S., Canada, and Venezuela. If they don't, the present domestic crude-price position would be jeopardized. Domestic crude couldn't compete on the East Coast--or maybe the Gulf Coast--with 25 cents added to the already big pre-Suez differential.

Here's a sharp trade that has oil men whistling about high prices. The Navy recently asked bids on a 5-year contract to buy its production in Elk Hills Reserve. Standard Oil of California offered to pay the posted price. Three independents got the contract, however, by bidding 12-1/2 cents a barrel above posted price. It seems some in Government think prices are too high when oil producers are getting paid. But when the Government is selling, the sky's the limit.

The Harris-O'Hara gas bill has the much-needed support of the White House.

Eisenhower backing improves chances for the bill, but it's still a long way from home. House Speaker Sam Rayburn says the President's action will be enough to get the measure considered this session. But Rayburn warns: "The bill will not be pressed for action unless we get some votes we didn't get before and it's up to the President to get them." Arkansas Senator Fulbright who led the gas-bill fight in the Senate last time now says he will not sponsor the new bill, which already has picked up some familiar foes in early skirmishing. Also industry so far is divided over merits of the bill (P. 79).

Importance of the petroleum industry is underscored by latest report of National Industrial Conference Board. It reveals five of the top 10 manufacturing companies are oil firms and 10 of the first 20 include oil. In fact, 21 oil firms hold 31-1/2 per cent of the assets attributed to the top 100 companies in the nation.

For DRILLERS, a retractable rock bit is a commercial possibility for the near future. The bit, which has both three-cutter and four-cutter models, was developed in the Tulsa laboratories of Carter Oil Co. Dresser Industries has offered to take a nonexclusive license on the bit, but the deal hasn't been completed.

If it is perfected, the bit would be a boon to contractors and oil companies. It works on a wire line. The bit is lowered to the bottom of the hole, where it locks to the drill stem and opens to full diameter. When it becomes dull, it is disengaged, folded to a smaller diameter, and is pulled up the drill string without the need for a round trip. Standard bit parts are being used in the working models to simplify production problems. Patents are held by Esso Research & Engineering Co.

Real deeper drilling is being retarded by a shortage of tubular goods with extra high strength. Wells in the 20,000-ft. range severely tax limits of present casing, drill pipe, and tubing. Steel men have turned to a process called "quench and temper" which is producing experimental grades with strengths as high as 140,000 to 170,000 psi (P. 113).

Russia's latest 5-year drilling plan is bogging down. For the third straight year total footage drilled has remained unchanged, and the Ministry of the Oil Industry is worried. The ministry's magazine pins the blame on improper bits for the turbodrill, inadequate supplies of casing, drill pipe, steel cable, bits, chemicals, and other materials, and slow delivery of spare parts for equipment.

EXPLORATION men are finding the Illinois basin is turning into an independents' refuge, and many operators are doing well there. Strat-trap exploration is a prime favorite of the new play. It also is sparked by these factors: Shallow drilling depths, low cost of leasing and drilling, numerous pay zones, rapid payout on wells, relatively few drilling hazards, and success of fracturing on marginal wells or abandoned dry holes (P. 177).

Exploration notes: Standard-Vacuum will spud its first wildcat in India's vast Bengal basin before the month is out. Stanvac already has spent $2.5 million on exploration work, and the wildcat will add $1.5 million more to the

investment in 10,000-sq. mile exploratory concession... Large 40-year concession on Surinam (Dutch Guiana) has gone to Marts Oil Co. of Bartlesville, Okla. The grant ranges over a belt from 25 to 55 miles wide along the Atlantic Coast the entire length of the island. Drilling will start this fall... A 5-mile successful stepout in Eastern Venezuela may set off a new deep-producing trend in Greater Oficina area. The test, Aguasay 4 of Sinclair's Venezuelan Petroleum Co., is being completed for better than 1,600 bbl. daily... Shell and Continental have made joint cash offer of $12,175,000 for drilling rights on the tidelands owned by Hermosa Beach, Calif.

PRODUCTION men are turning up plenty of water-flood news. For instance:

...Fracturing has come into its own as a tool for water-flood operators. It's still a ticklish process, though, and you have to be careful in choosing the right well. In fact, one expert terms fracturing a method of conditioning the well bore only, because deep penetration into the formation is not desired (P. 119).

...Filters may be an unnecessary frill in some water floods. That's the story coming from the Los Angeles basin. Socal engineers there have abandoned the filters on three projects. This means a big reduction in costs, since filtration accounts for about one-half the total water-treating and handling costs. But the Socal study points one word of caution: Unfiltered water can't be used universally--only where plugging is not a serious problem.

...Two more large water floods are in the works in Texas: Humble wants a flood of Zone 20-E of the Frio underlying its 1,960-acre lease in big Seeligson field in Kleberg and Jim Wells counties... William B. Neely and George T. Abell are seeking permit to flood the Devonian underlying Abell field in Crane and Pecos counties.

First offshore field in the Middle East finally has gone on production. It's Aramco's Safaniya in the Persian Gulf off Saudia Arabia. Flow of 50,000 bbl. daily started moving by pipeline to Ras Tanura last week. It will be stepped up to 175,000 bbl. daily by mid-1958. With Safaniya producing, Aramco exploration men are turning their attention to another promising structure in the Persian Gulf at Manifa Bay. It's about half way between Safaniya and the new onshore field of Khursaniyah (P. 98).

REFINERS are being warned to ease up on lube-oil production or mounting inventories will soften prices. Sinclair's Paul W. Zumbrook says production was 89 per cent of capacity last year, stocks are building up outside the Pennsylvania-grade area, and runs elsewhere in the nation must be cut back to a lower percentage of capacity. Total demand for U.S. lubes is expected to remain essentially the same this year as in 1956. Domestic demand should edge up from 43.9 to 44.3 million barrels, but exports will offset this by dropping from 13.9 to 13.5 million barrels.

Pressure from large labor units is more disturbing to many small refiners than any competition from the major oil outfits.

Quaker State Oil Refining President G. B. Hunter gave this picture to National Petroleum Association: "A large percentage of the refinery labor

contracts in the U.S. either have expired or are open for negotiation at the present time. There are many cases where the employer and the local union representing its workers are ready to enter into an agreement covering their own local conditions. These local unions have been prevented from entering into an agreement, however. The international union wants to hold the threat of an industry-wide strike over the industry and public in order to force a national-wide pattern of bargaining.

"Such tactics destroy true collective bargaining between an employer and the representatives of his own employees. We think it is imperative Congress provide some regulation of labor unions to protect the workers and the public against abuses and to make it possible for local unions and their own employers to negotiate at the local level instead of being forced to accept a national pattern."

Here's a new fuel twist: One railroad is using atomic-radiated coal mixed with heating oil as fuel for diesel locomotives. It estimates the new fuel will save $400,000 annually. Denver & Rio Grande Western Railroad researchers also are making radiation tests with low-test, low-cost diesel fuel oils. First tests show that undesirable, slow-to-burn particles in the oils can be broken to micron size. They then burn as efficiently as high-test, high-priced diesel oils.

The Venezuelan government's budding refining and chemical complex at Puerto Cabello west of Caracas on the Caribbean has private oil companies concerned. Government expects to spend $300 million there in next few years for refinery, petrochemical plants and natural-gas pipeline system.

Trend from pneumatic toward electronic instruments in persistent and significant of things to come. Even those who champion electronic instruments admit these improvements are needed: Cheaper costs, more simple construction, easier maintenance, and more dependability. But the key is converting the final control valve from pneumatic to electrical operation. For the full story on what's involved in this interesting work see page 108.

Offshore PIPELINE contractors expect a busy season. Biggest job now in sight is proposed 55-mile line to move natural gas to shore. The T.G.T. project is awaiting FPC approval. Plans also have been filed recently for several offshore crude lines extending to submerged fields near shore, and construction is expected to pick up sharply in coming months as development drilling increases.

Higher than expected production in Colombia is prompting plans for second crude line from the Magdalena Valley to the Caribbean. Forecasts indicate available crude soon will exceed capacity of the Andian National Corp. system. Last year it moved an average of 85,700 bbl. daily, up 15 per cent over 1955. Principal shippers are Shell-Condor and Texas Petroleum. Producers not connected with Andian would build new line.

Big showdown in the fight over the growing Midwest natural-gas market will come in FPC hearings starting May 14. The battle matches Canadian and U.S. gas in competing applications by Midwestern Gas, Michigan Wisconsin, Northern Natural, and Natural Gas Pipeline. Natural Gas Pipeline just beat the deadline last week with a bid to add 185,000 M.c.f. daily to its share of the market.

MARLEY IS STILL TESTING TOWERS

Here are the current results—a consecutive list of **ALL** acceptance tests conducted by Marley during 1956 on Cross-Flow industrial towers. Although towers tested were of many sizes and capacities, operating under varying conditions and in various parts of the country, there is one "common denominator" in all the tests—the positive performance of Marley cooling towers. Better than words, better even than written guarantees, these tests are your assurance of complete performance satisfaction when you purchase a Marley cooling tower.

The Marley Company has long pioneered the policy of "test your tower," for we believe that every purchaser is entitled—if not obligated—to know the performance of his tower in exact and authoritative terms. We also believe that every prospective purchaser is entitled to know the performance record of Marley towers, and for this reason have consistently published the results of Marley's own tower-testing program.

If you'd like to know the Marley method of measuring performance of cooling towers, regardless of make or vintage, we invite you to write for our technical publication, "TEST YOUR TOWER."

TEST NO.	TYPE OF SERVICE AND LOCATION	SPECIFIED CONDITIONS				TEST RESULTS	
		Gallons Per Minute	Hot Water Temp.	Cold Water Temp.	Wet Bulb Temp.	Degrees Cold Water Temp.	Percent Capacity
1	Generating Station—North Central	49,200	100.8°	85°	74°	+.26°	+2.3%
2	Generating Station—Southwest	28,000	99.5°	83°	74°	+.15°	+1.5%
3	Chemical Plant—East Coast	33,000	105°	86°	81°	+.43°	+12.7%
4	Generating Station—Mid-West	62,400	107.5°	90°	76°	+.02°	+.13%
★5	Petrochemical Plant—Mid-West	10,000	105°	83°	76°	—.25°	—2.14%
6	Petroleum Refinery—Mid-West	8,500	120°	85°	76°	+.15°	+1.35%
7	Generating Station—Mid-West	26,000	110°	91°	75°	+.70°	+3.4%
★8	Petroleum Refinery—Gulf Coast	21,000	113°	90°	80°	—.45°	—2.85%
9	Petrochemical Plant—Gulf Coast	6,000	105°	85°	80°	+.06°	+.69%
10	Petrochemical Plant—East Central	21,000	120°	85°	73°	—.2°	—1.5%
11	Generating Station—Southwest	38,700	93°	78.5°	65°	—.4°	—2.15%
★12	Generating Station—North Central	7,180	101°	87°	74°	+.1°	+.77%
13	Generating Station—East Coast	26,400	96°	86°	79°	+.30°	+4.17%
14	Petroleum Refinery—Mid-West	8,000	120°	84°	74°	+.70°	+6.4%

★ Tested in accordance with Cooling Tower Institute test procedure ATP-105 and observed by CTI representative.

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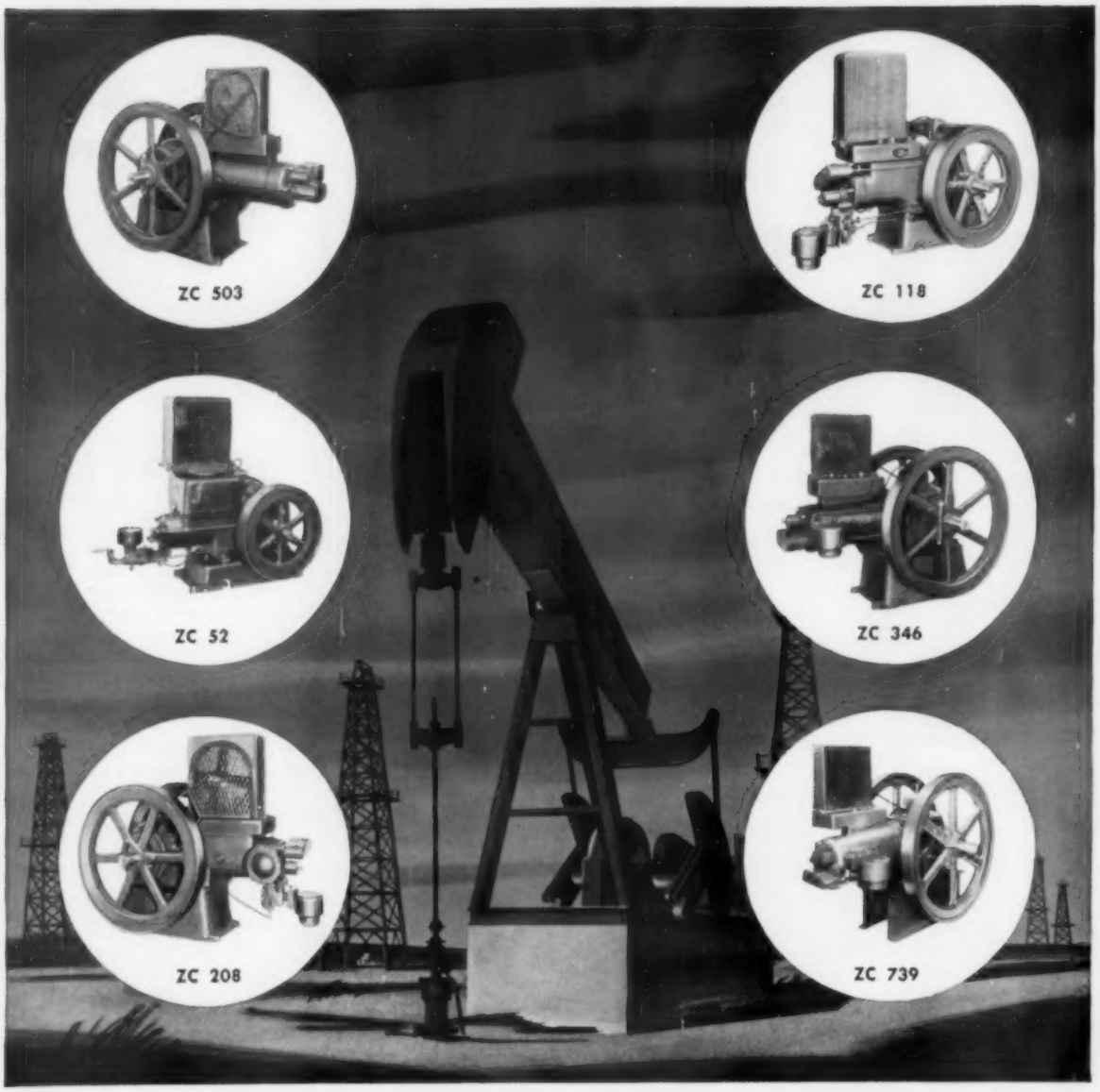

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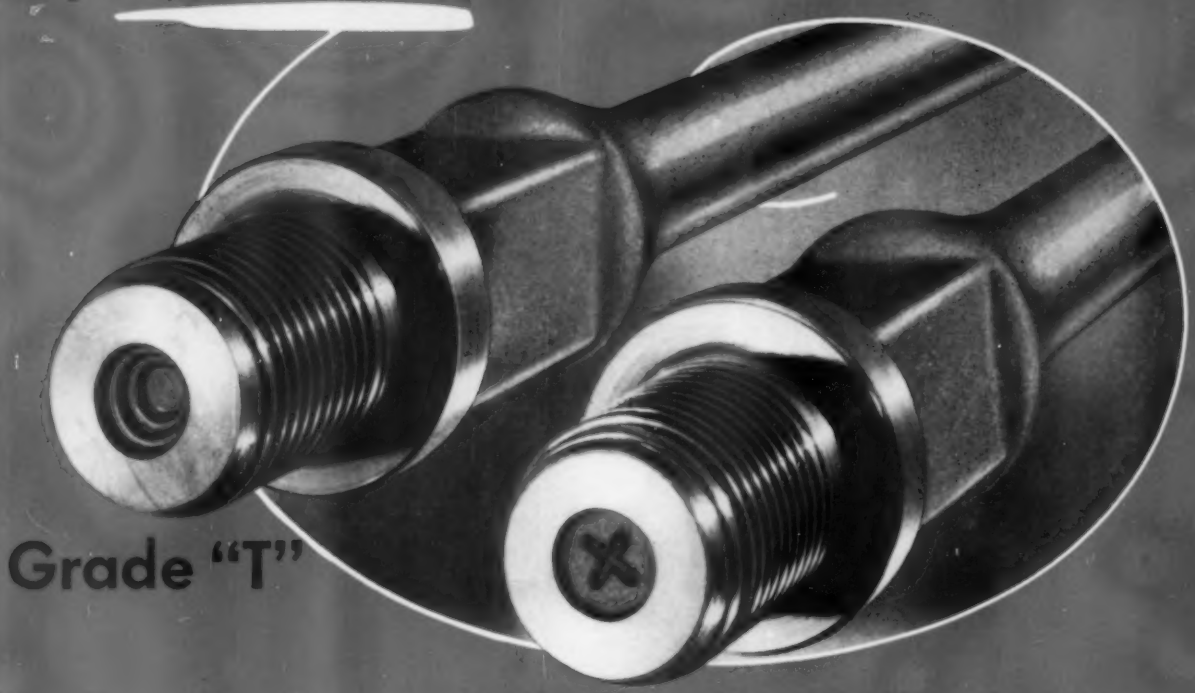

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or Grade "W"

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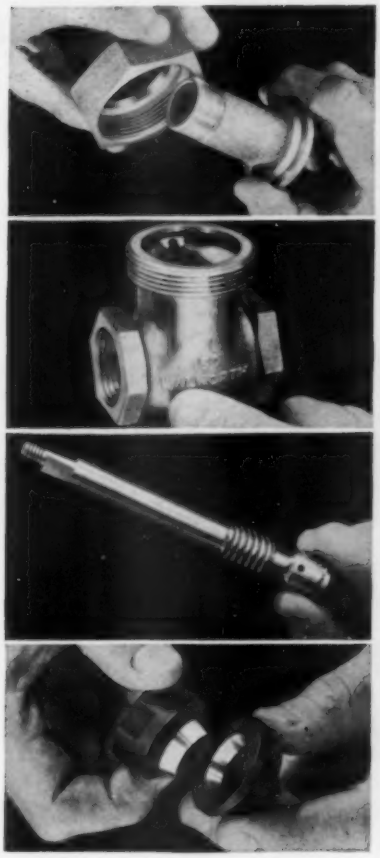


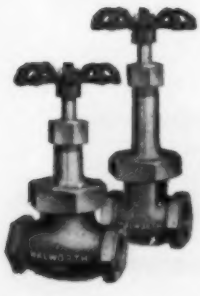
TYPICAL OF WALWORTH QUALITY is the union body-to-bonnet connection which stiffens the body against internal pressure; makes taking the valve apart a simple operation and reduces the chances of distortion or leakage even though the valve is repeatedly taken apart and reassembled. With this type of construction there is no possibility of the bonnet coming off the valve while the handwheel is being turned.

HEAVY BODY CONSTRUCTION is typical of *all* Walworth Bronze Valves. Extra-thick walls and rugged wrench hexes constitute a high safety factor and prevent distortion while the valve is being installed in the pipeline. Extra-deep pipe threads are accurately machined to eliminate leakage. Walworth Bronze Valves are also available with flanged, silver-brazed or soldered ends in certain sizes and types.

EXTRA-LARGE STEMS with extra-long, extra-deep threads prolong valve life, protect against wear and distortion and provide tight positive shutoff. The surface of the stem is machined to a glass-like finish for minimum handwheel effort and to preserve the packing which results in fewer inspections and less maintenance. The top of the stem is tapered and squared to hold the handwheel securely.

TO REDUCE WIRE DRAWING to a minimum, certain types of bronze globe valves have stainless-steel plug-type seats and discs heat-treated to a nominal hardness of 500 Brinell, adding years to valve life even in severe services. These valves can be tightly closed on sand, grit or pipe scale without damage. Seats and discs are machined simultaneously, assuring perfect mating.

There is a Walworth Bronze Gate, Globe, Angle or Check Valve for every service. Walworth is continually developing new valve types and materials, including plastics, to keep pace with the growing variety and severity of services in modern industry. For full information, see your Walworth Distributor or write: *Walworth, 60 East 42nd Street, New York 17, N.Y.*



WALWORTH

Bronze Valves and Fittings

ACCEPTED WORLDWIDE

CONTINENTAL-EMSCO

A-800 POWER RIG

(800-1100 H.P.)

has been thoroughly field proven under drilling conditions the world over!

Easy TO MOVE

The 3-engine rig ships easily on 4 trucks in 4 convenient packages. Minimum of tear-down and rig-up time.

Easy TO MAINTAIN

Heavy duty construction, highly effective automatic lubrication, simple practical design insure minimum low-cost maintenance. Parts are readily accessible.

Easy TO LIKE

For medium and deep wells, the A-800 does its job so well and is so easy to operate, maintain and move, that it's a favorite already with drillers everywhere.

Easy TO OPERATE

Greatly improved brake system, including rim cooling, new friction-compounding clutch, control console, and many other new features make this rig simple and easy to operate.

For complete information on the rugged Continental-Emsco A-800 Rig, call Continental-Emsco today.

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

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General Offices: DALLAS, TEXAS • Plants: LOS ANGELES • HOUSTON • GARLAND, TEXAS

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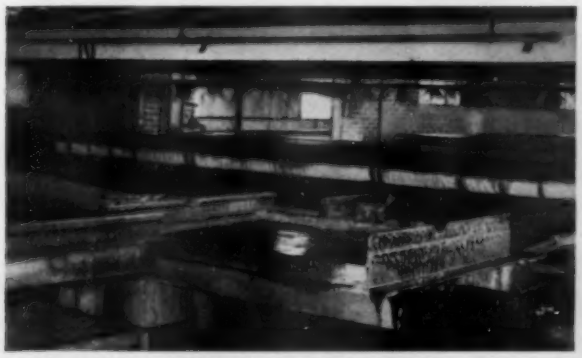
Representatives in All Principal Oil Fields of the World

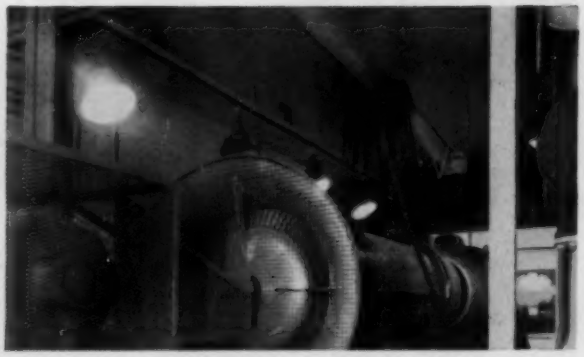
R-704

How to set your mind at rest about FIRE!

YOU can't be expected to know *all* the answers about every type of fire hazard. But Grinnell, with 87 years' experience protecting against fire hazards of every description, has thorough background knowledge upon which you can draw. Let a Grinnell Fire Protection Engineer recommend the best system for you . . . whether it be water spray, air foam, carbon dioxide, or dry chemical.



WATER SPRAY PROTECTION Asphalt coating machine at Alabama Pipe Company, Anniston, Ala., has a Grinnell ProtectoSpray System.



AIR FOAM PROTECTION Engine test cell at Trans World Airlines, Inc., Kansas City, Mo., is protected by a Grinnell ProtectoFoam System.

DRY CHEMICAL PROTECTION Hot oil dip tanks at Royal Canadian Air Force Supply Depot, Namao, Alta., has a Grinnell dry chemical installation.

CARBON DIOXIDE PROTECTION Record storage vault at West Penn Power Company, Greensburg, Pa., uses a Grinnell carbon dioxide installation.

Remember, extra hazardous areas, where special protection must be provided to insure against possible serious loss by fire, are fairly commonplace in industry today. Illustrated here are a few of these, along with the fire protection systems recommended to arrest fire. But there are many others, where major or minor supplements to ordinary-hazard fire protection systems are necessary, if trouble is to be averted.

With a full range of equipment, you can rely on Grinnell to give you unbiased recommendations on the system best suited to your requirements. Remember, too, the installation of the proper Grinnell System usually serves to reduce fire insurance premiums drastically, often pays for itself in a few years. So don't delay. For further facts, write Grinnell Company, Inc., 256 West Exchange Street, Providence, R. I. Branch offices in principal cities.

GRINNELL

WHENEVER FIRE PROTECTION IS INVOLVED

Manufacturing, Engineering, and Installation of Fire Protection Systems since 1870

BAKER announces an ALL NEW PNEUMATIC-TIRED FORK TRUCK

Trail Axle
Double-yoke construction for extra strength. Longitudinal mounting in jumbo rubber blocks to provide lateral oscillation and absorb ground shocks.
Power Unit
Heavy-duty industrial gas engine with extra stamina for continuous rugged service. Features maximum fuel economy—minimum maintenance.
BAKER
Power Steering
Standard at no extra cost. Effortless full-time power steering means less operator fatigue, greater safety and more work per day.
Lift and Tilt Controls
Conveniently located and easily manipulated levers for positive control of hydraulically-operated hoist and tilt motions.
Drive Axle & Transmission
Rugged Timken industrial truck axle and heavy-duty transmission, with two speeds, forward and reverse.
Single or Dual Wheels
Large pneumatic tires on drive wheels, with deep treads for maximum traction. Dual wheels available for extra heavy duty, better flotation and added stability.
Brakes—Hydraulic self-energizing, full-floating type—in drive wheels. Self energizing in both forward and reverse. Duo-grip, two-shoe independent parking brake on transmission shaft.

This Baker FGF-40, 4,000-lb. YARDLOADER, first in the new line of Baker pneumatic-tired gas fork trucks, has many new design features for greater maneuverability and more dependable performance. It is *fast*—top speed with load, 8.6 mph. It is *compact*—only 48 inch wheelbase, and minimum overhang—*and only 79 inch turning radius.* Low center of gravity makes this possible without sacrificing stability.

Absence of cowl provides maximum visibility. Power steering and many other driver conveniences make it one of the easiest handling fork trucks—and one of the safest. Full 130-inch lift, with single or dual cylinder. Truck-loading mast available with 110-inch lift and 71-inch overall height . . . For complete information ask for Bulletin 1382.

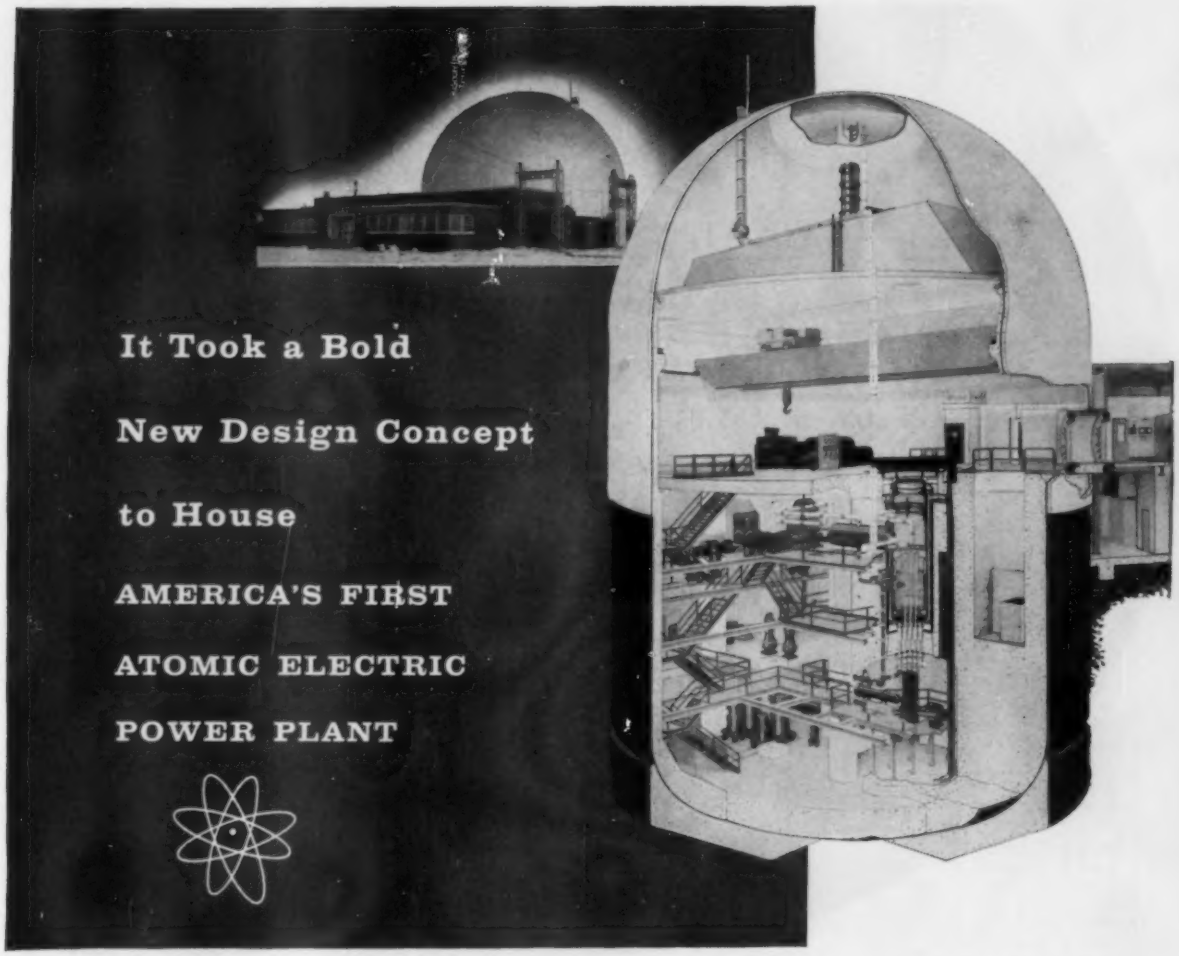
Baker industrial trucks

THE BAKER-RAULANG COMPANY

1247 WEST 80th STREET • CLEVELAND 2, OHIO

A Subsidiary of Otis Elevator Company

Otis 7G1



How do you house an atomic electric power plant? Dig a hole five stories down. Erect a giant ten-story welded steel "containment vessel." Seal it off air-tight, and you have one of the largest pressure vessels man has ever been called on to build.

That's the story, over-simplified, of the unique housing required for America's first nuclear-powered electric plant, the Experimental Boiling Water Reactor, at Argonne National Laboratory, Lemont, Illinois.

In our practical, efficient world of engineering, there is a sound structural reason for the unusual dome-shaped building, now recognized by everyone as the symbol of atomic-power-for-peace.

Radioactive steam and gases must be contained within the system. The precautions necessary demanded an air-tight building, 80 feet in diameter by 119 feet high.

This giant welded steel structure, designed to withstand a pressure of 15 pounds per square inch above gage pressure, was made concave throughout, with a semi-ellipsoid bottom and a hemispheric top.

Upon completion, the half-million cubic foot shell was tested for air-tightness. Never before had so large a welded structure required such thorough testing against air loss.

Graver's skills, backed by a century of experience, were called upon to fabricate, erect and test this unique steel structure.

Graver's research department devised the special air-tightness testing procedures. Graver fabricated all sealing devices—the access air-locks, bulkheads and doors, and the two water-demineralizing systems. It also furnished the saucer-shaped 15,000 gallon water tank suspended under the dome.

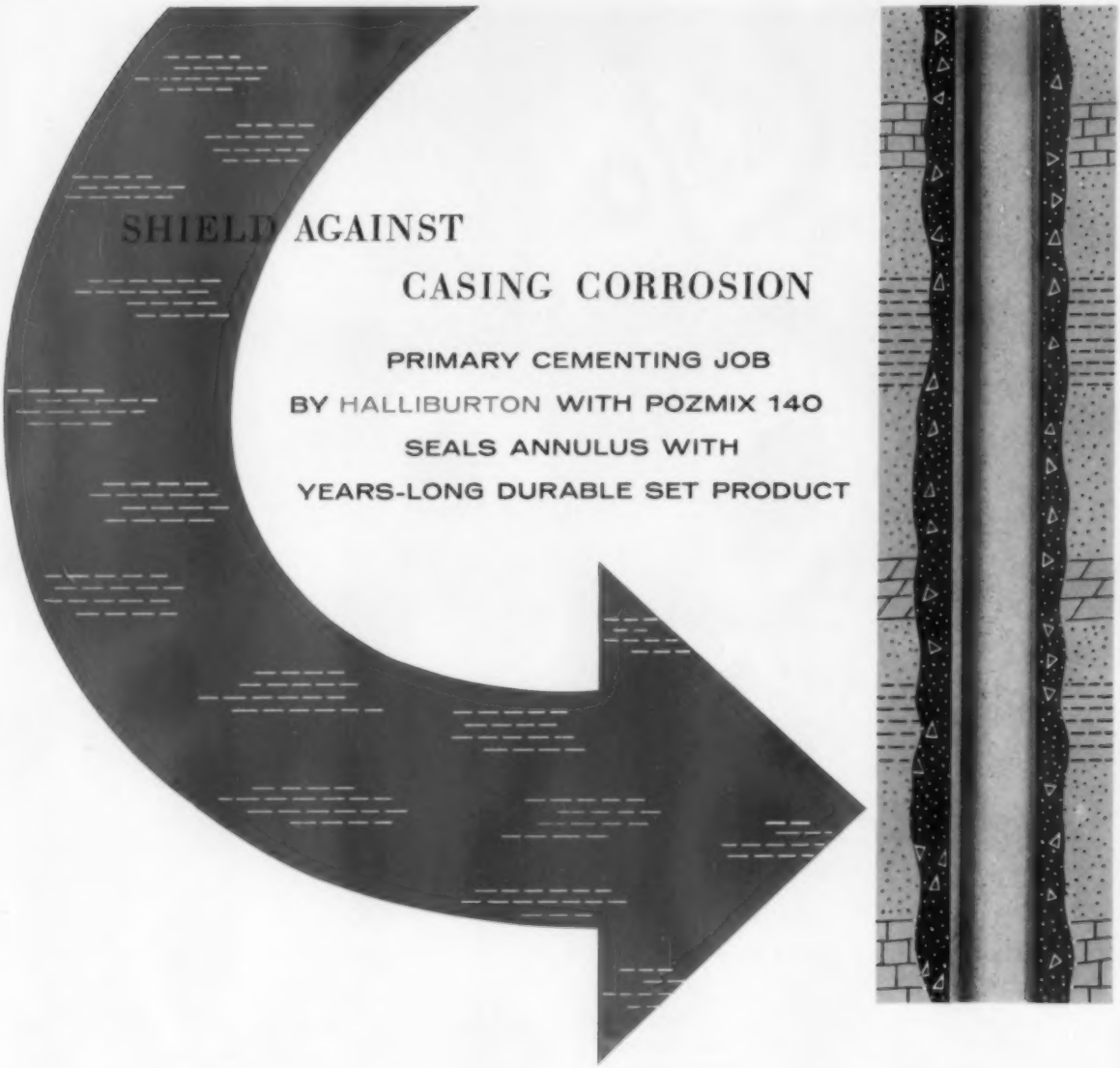
This application of Graver's skills in the fabrication and erection of America's first atomic power plant is indicative of Graver's readiness to help you fulfill your plans for the future, no matter how unusual or exacting the requirements.

Building for the Future on 100 Years of Craftsmanship in Steels and Alloys

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA • NEW YORK • PHILADELPHIA • EDGE MOOR, DELAWARE
PITTSBURGH • DETROIT • CHICAGO • TULSA • SAND SPRINGS, OKLAHOMA
HOUSTON • LOS ANGELES • FONTANA, CALIFORNIA • SAN FRANCISCO

GRAVER



Year after year, an undisturbed shield of Halliburton's Pozmix 140 Cement around your medium to deep string will continue to offer exceptionally high resistance to leaching or attack by underground waters. That's because the set product contains no soluble ingredients that would invite penetration of cement sheath by formation fluids.

Lessens problems of placement in well, too. Adjustable for extremely long pumpability at temperatures from 140° to 400° F. and higher. Light weight slurry with low friction coefficient lessens forces on weak formations and on well equipment. However, Pozmix 140 slurries are extremely adaptable and can be weighted with selective materials for controlling high pressure formations. Yet in spite of many superior features, Pozmix 140 *costs decidedly less than conventional cements.*

Like all Halliburton cementing, a Pozmix 140 job is performed with the finest pumping and handling equipment by the best trained oil well cementing staff, backed by the leading oil well service laboratory. When you cement, consider the long-range profit history of your well.

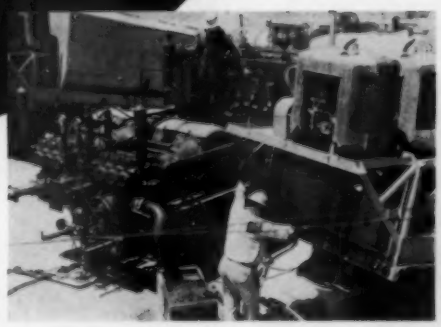
Call the local office or write Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

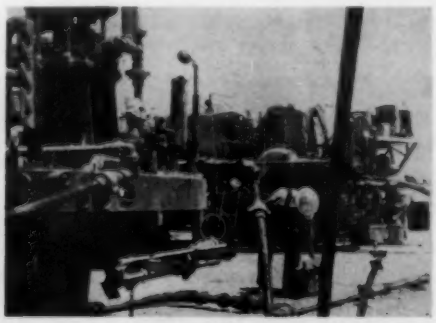
HALLIBURTON
OIL WELL CEMENTING COMPANY

VALUE OF HALLIBURTON CEMENTING INCREASED BY SKILFUL USE OF ADDITIVES

Regardless of the basic cement specified for your casing cementing job—Pozmix 140, Pozmix Cement or portland cement—your Halliburton cementing crew is prepared to apply Halliburton's 3-million-job experience to the custom tailoring of a mix designed to give you excellent results, both during placement and after setting. Among additives available for formulation are...

SET ACCELERATORS AND RETARDERS	Calcium chloride	Accelerates early strength development and reduces W.O.C. time.
	HR-4 and HR-7	Retard thickening time, allowing placement of slurry in deeper wells. HR-4 for 0 to 4% gel cement. HR-7 for high gel cement compositions.
WEIGHT CONTROL ADDITIVES	Howcogel	Blended with portland cement to form Halliburton gel cement. Increases mixing water requirements. Reduces weight. Improves suspension.
	Diacel D	For lightest weight cements producing weights as low as 11 lbs. per gallon.
	Hi-Dense	Weight material designed for better control of high pressure oil and gas zones. Slurries can be weighted to 20 lbs. per gallon, yet retain good strengths and pumpability.
WATER LOSS CONTROL ADDITIVES	HR-7	Dispersing agent used with Howcogel in making low water loss high gel cement. Also a retarder.
	Diacel-LWL	For producing low water loss properties with portland cement, Pozmix Cement or Diacel cement systems.





"There is no substitute for experience in Oil Well Cementing"

CEMENTING SERVICES

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

Transportation. The Universal 'Jeep'* and the 4-Wheel-Drive 'Jeep' Station Wagon, with the extra traction of their 4-wheel drive, take supervisors, work crews or tool-pushers and their equipment and supplies almost everywhere on the lease, road or no road, up 60% grades, through water 2 feet deep... wherever they have to go, in good weather or bad.

How 'Jeep' all-wheel traction speeds oil and gas operations!

New Forward Control 'Jeep' FC-150. This advanced 4-wheel drive truck puts a 74" pickup box on a wheelbase only 81" long. With its "go-anywhere" maneuverability, and 200% greater forward visibility, it takes supplies and crews where the pipeline leads.

Exploration. With the extra traction of its 4-wheel drive, the Universal 'Jeep' travels remote terrain for prospecting and exploration. In good weather or bad, it takes geologists, crews, equipment and tools almost anywhere in rugged country.

The oil and gas industry pioneers far ahead of roads. It needs the extra traction of rugged 4-wheel drive 'Jeep' vehicles to get through where ordinary vehicles can't, to stay on the job and keep work moving smoothly and on schedule, in good weather or bad.

'Jeep' vehicles are the only 4-wheel drive vehicles in their weight class designed and engineered completely for 4-wheel drive off-the-road use.

For exploration and prospecting... on the lease... along the pipeline... versatile 'Jeep' vehicles carry men, tools and equipment through mud, sand, soft earth, over the roughest terrain. With power take-off, they provide on-the-spot power to operate many types of equipment, from mobile drills to winches. They haul heavily loaded trailers on the road or off. And they shift easily into conventional 2-wheel drive for highway travel at top legal speeds.

Billions of miles of use prove that 'Jeep' vehicles spread their cost over many jobs... provide additional savings through long life, low maintenance costs and high resale value. Ask your Willys dealer for an on-the-job demonstration today.

The 'Jeep'®

family of 4-Wheel-Drive vehicles

WILLYS... makers of the world's most useful vehicles

*Model CJ-5 shown

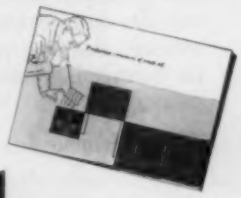
WILLYS MOTORS, INC., TOLEDO 1, OHIO

HOW MANY TESTS to get effective, economical dehydration?

When an Aquaness field man comes to your lease to find the best demulsifier for your emulsion, there's no telling how many checks he may run before he comes up with the final answer. You can be sure, however, that when he finishes he has narrowed down his recommendation to the *one* demulsifier that will treat your emulsion to pipeline standards at the lowest overall cost to you.

Aquaness men are as tough to satisfy, when they're working on your problem, as you would be if you were doing the testing yourself. They not only investigate which of the many Aquaness demulsifiers and blends will break your emulsion best . . . but they re-check to find the minimum amount that will produce the lowest BS&W content.

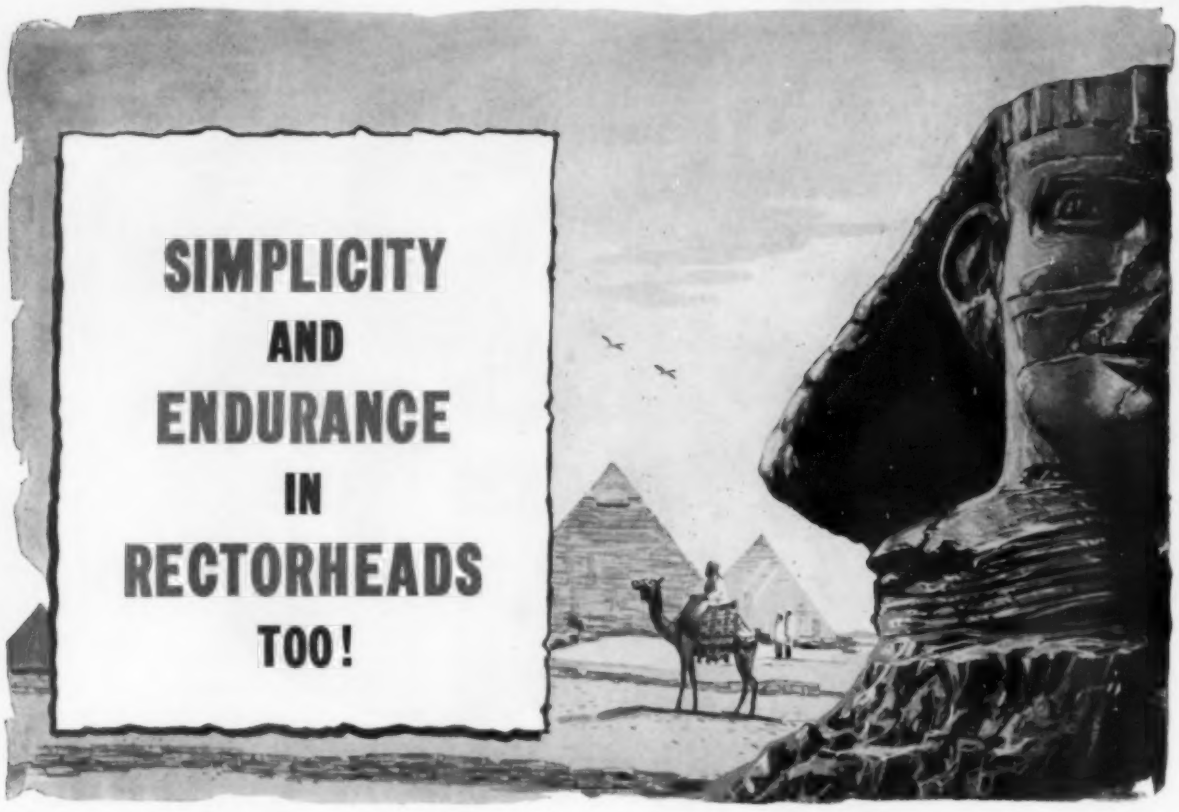
Aquaness thoroughness pays dividends for you. Call the nearest Aquaness representative today for a test on your lease.



Write for the new Aquaness booklet, "Production Treatment of Crude Oil."

Aquaness *Department*
ATLAS POWDER COMPANY
2005 Quitman Street, Houston 26, Texas

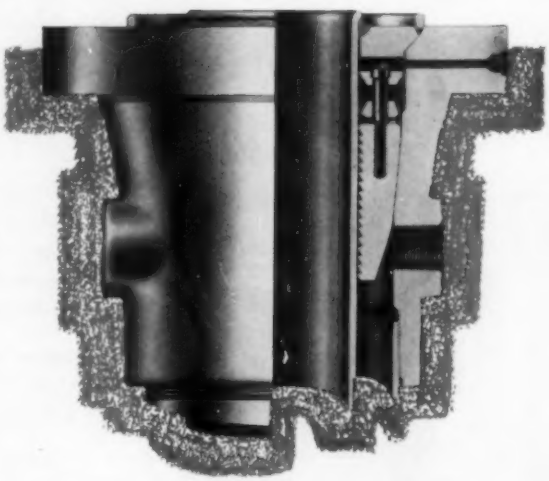
SIMPLICITY AND ENDURANCE IN RECTORHEADS TOO!



The ring-of-steel seal employed in RH Casing Heads is unmatched for simplicity and endurance. In oil fields throughout the world it has survived fires — endured for years without leaking or replacement.

The patented welding ring, welded to the pipe and sealed at the head body with API ring gasket is simplest of all to install. ***The welding ring prevents any well or frac pressure being transmitted to the slips, creating a hydraulic force which would collapse or crush the pipe.***

There is no soft or resilient packing to "flow" under high pressure or temperature; to "freeze" and contract under low temperature; to burn out or deteriorate after years and years of service. Positive proof of this endurance is to be found in more than 100,000 Rectorheads now in service.



At authorized supply stores everywhere.

RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER

1100 NORTH COMMERCE ST. FORT WORTH, TEXAS

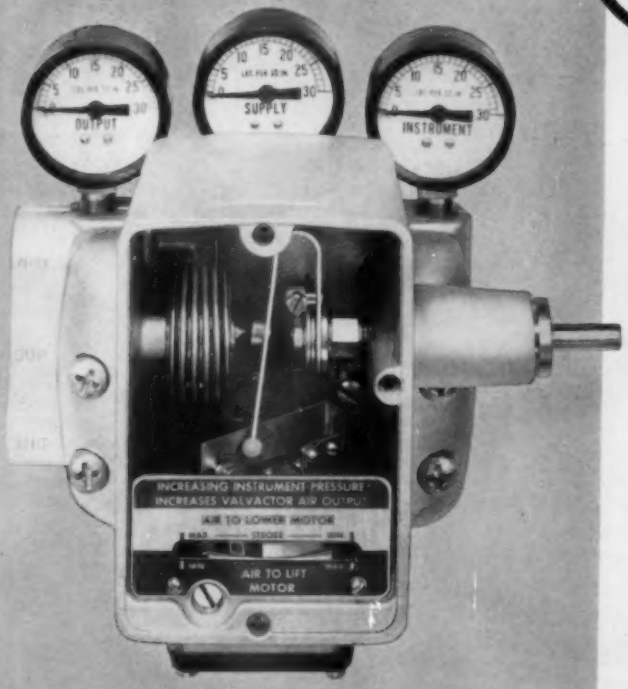
Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

NEW!

MOST UNIVERSALLY ADAPTABLE VALVE POSITIONER ON THE MARKET!

...the Foxboro Type C
VERNIER VALVACTOR*



The Type C Valvactor's distinctive motion-balance principle of stem positioning eliminates loading effects of heavy fixed-stroke actuating springs. Note compactness — the simplest mechanical design of any valve positioner.

**Trademark of a precision valve positioner made by The Foxboro Co.*

Unique Flexibility Easily reversible in seconds. Sequencing by two simple adjustments.

Super Response Full air-pressure output to diaphragm motor on signal air-pressure change as small as ½ of 1% of signal span.

Extra Speed New, high capacity relay provides high speed positioning action.

Positive Positioning Direct, motion-balance feed-back assures instantaneous, pin-point positioning.

Now there's a positive-action, super-precision valve positioner that you can easily adapt to *any* diaphragm motor application — without exchange of parts! It's the Foxboro Type C Vernier Valvactor with unique motion-feedback.

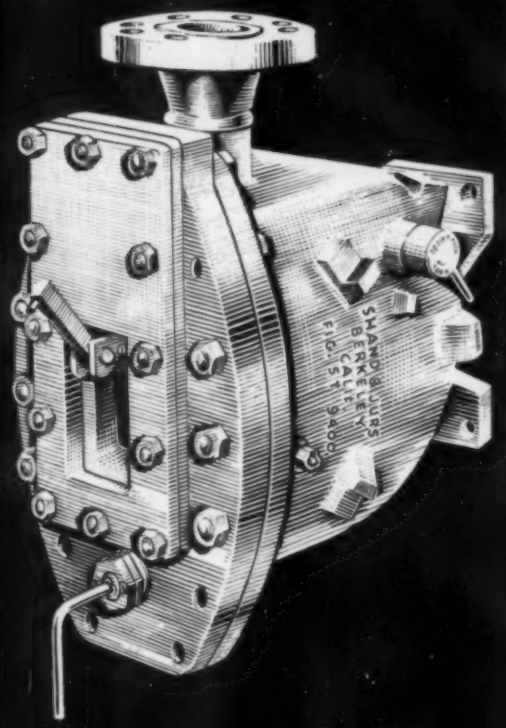
The Type C Valvactor has a master setting disc which provides easy change of action as required by the control system, as well as easy reversal of Valvactor action for air-to-open or air-to-close control valves. Adjusting for limited stem travel is equally simple ... sequencing of several valves is a cinch!

The Valvactor is the ideal solution to such problems as stem friction, plug friction, valve motor and transmission line lag, and extreme process line pressure changes. And it requires practically no maintenance! Available with 3-gauge and by-pass manifold, or plain manifold. Write for full details.

The Foxboro Company, 604 Norfolk St., Foxboro, Mass., U.S.A.

FOXBORO
REG. U.S. PAT. OFF.
VALVE POSITIONERS

GREATER ACCURACY
in High Pressure Gaging of Storage Tanks



A NEW automatic tank gage for measuring product under pressures of from 150 to 300 pounds has just been released by S.&J. engineers, and brings new accuracy and safety to gaging tanks in which hand gaging is impossible and gage glasses are often inaccurate.

The new design incorporates a constant torque spring (Neg'ator Motor) which is an elastic member exerting a restraining force which does not increase as it is extended, giving consistent tape readings regardless of the position of the float. In addition to providing new accuracy over the entire range of float travel, this design also eliminates the conventional counterweight, with its supporting tape and housing.

This new high pressure automatic gage, identified as Fig. ST-9400 is available for both ground and roof reading. The gage includes an 18-8 stainless steel tape graduated to eighths of an inch and a tubular aluminum pressure type float as standard, with stainless steel float optional. Engineers interested in the ultimate in high pressure gaging are invited to request complete details, drawings and prices.

SHAND AND JURS CO.
A SUBSIDIARY OF
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110 E. 42nd St.

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M & M Bldg.

TULSA
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ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London S. W. 1
Whessoe, Ltd., Works: Darlington, County Durham

Bulldozer—operator lowers blade and levels site.

Sets up rig—same operator sets up drilling rig with crane.

"Goon" clears site, then sets up rig

Allison TORQMATIC Drive delivers the power in this new, self-propelled 50,000-lb. crane-bulldozer combination—the Rolahoist 25.

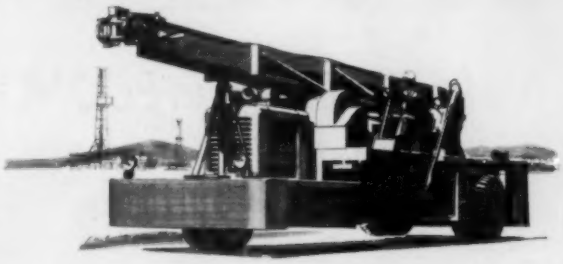
One operator does the job of four men with this revolutionary new Rolahoist 25 by Wagner-Morehouse of Los Angeles. This one piece of equipment drives to the job, grades the site and sets up the rig.

The Rolahoist 25 is self-propelled over the road—at speeds up to 35 MPH. Or, for long hauls it is low enough for transporting on a flatbed trailer.

The secret of the "Goon's" remarkable versatility is an Allison TORQMATIC CRT-3330 Converter-Transmission team. Providing high-torque multiplication, 3 speeds forward and 3 speeds reverse, the TORQMATIC delivers a smooth flow of power and quickshifts at full throttle in *all* ranges.

Allison TORQMATIC Drives are today making possible new equipment for easier, faster operation in many applications.

Ask your equipment dealer, or write Allison Division of General Motors, Box 894R, Indianapolis 6, Indiana.

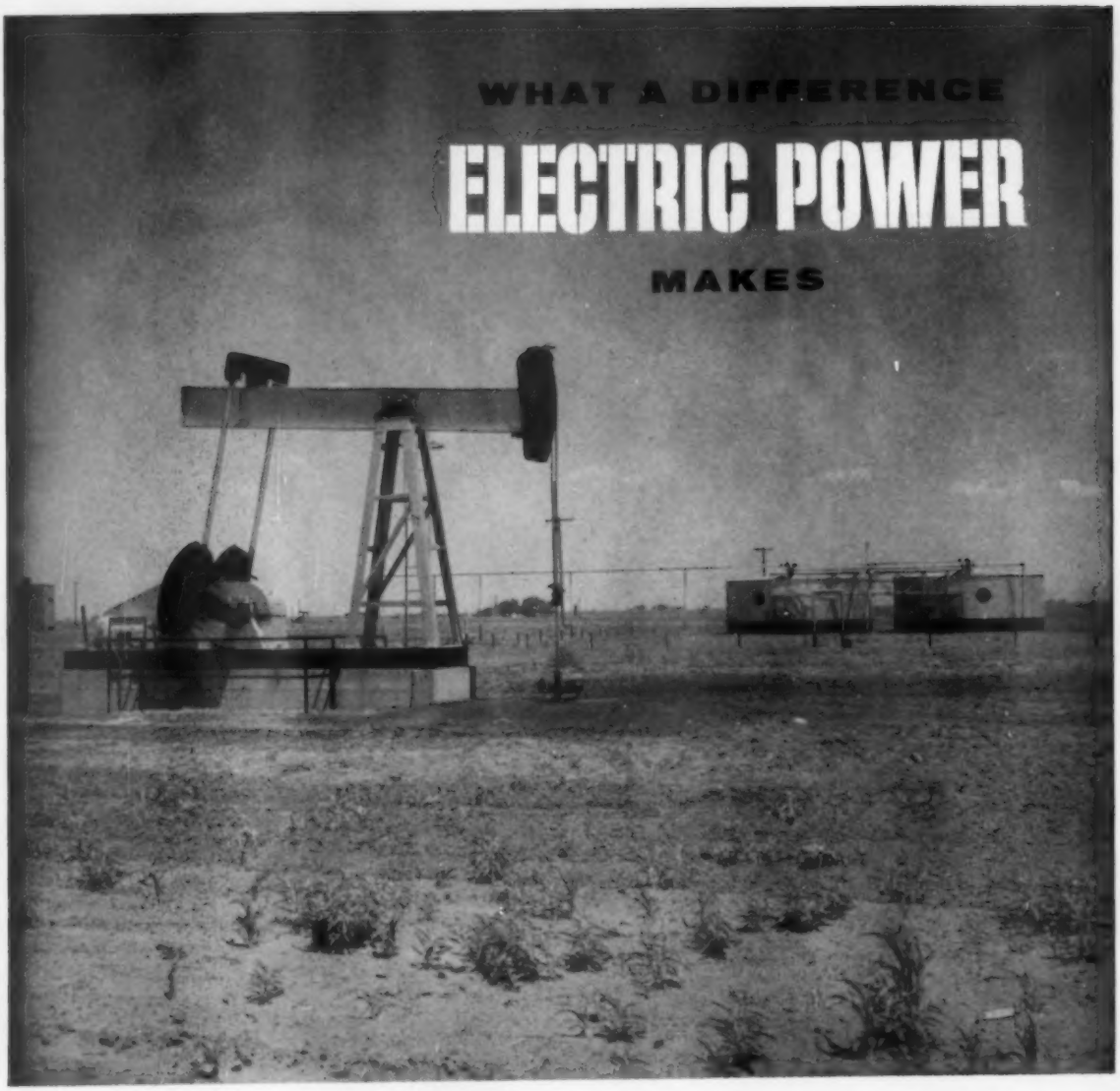


Moves on to next job—Rolahoist 25 is self-propelled for over-the-road travel.

GM TORQMATIC

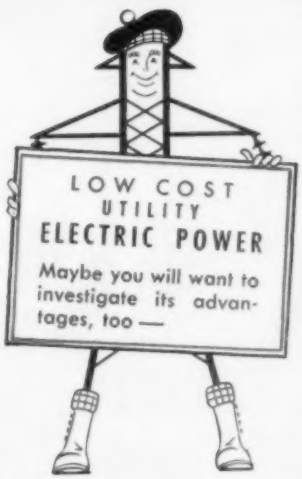
Allison

TORQMATIC DRIVES

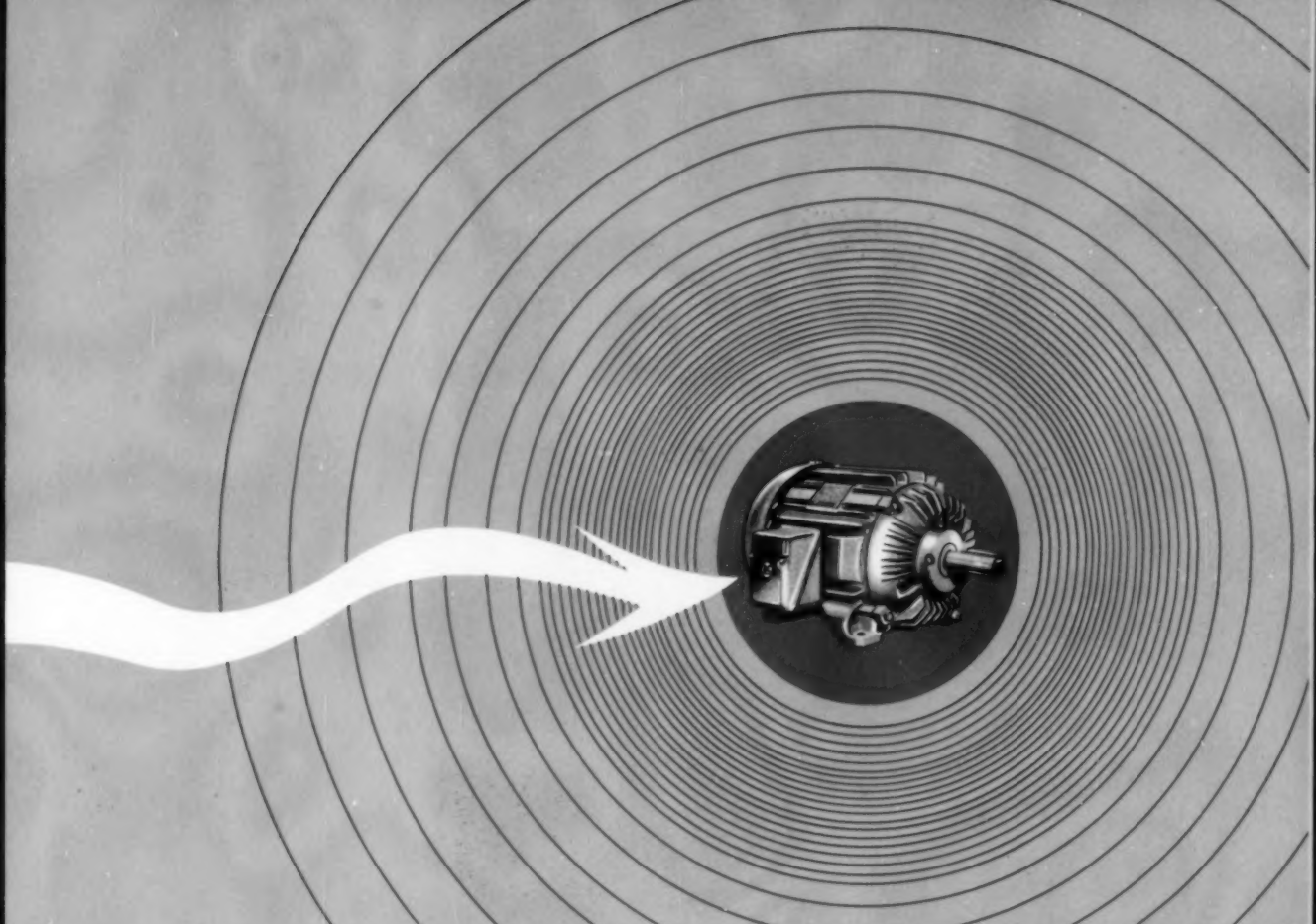


It's EFFICIENT and ECONOMICAL

Regardless of the pumping situation... The swing is to Electric Power for the job. In the past 2½ years there has been a steady increase of over 11% in Electrified pumping wells. The reason? Because your Utility Electric Power Companies have done more to advance engineering practices which pave the way for this progress and to provide more dependable and efficient power service when and where it is needed. Next time you specify Power... specify Low Cost Purchased Electric Power.



WRITE PETROLEUM ELECTRIC POWER ASSOCIATION, P. O. BOX 2771, DALLAS, TEXAS, OR CALL THE SALES ENGINEER OF YOUR LOCAL UTILITY ELECTRIC POWER COMPANY—NOW



The real cost of MOTORS

The cost of a motor extends over its entire lifetime. It does not end with purchase price. Cost *goes up* with every shutdown, every motor maintenance stoppage. Cost *stays down* when you buy quality. And quality means Allis-Chalmers.

All of these extras that don't show on the Allis-Chalmers nameplate — more copper, more iron, more cooling provisions—exemplify the quality-craftsmanship that goes in before the price tag goes on.

For the "long run," either as a new machinery component or as replacement, specify Allis-Chalmers. Find out more about *real* quality in motors from your A-C district office or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

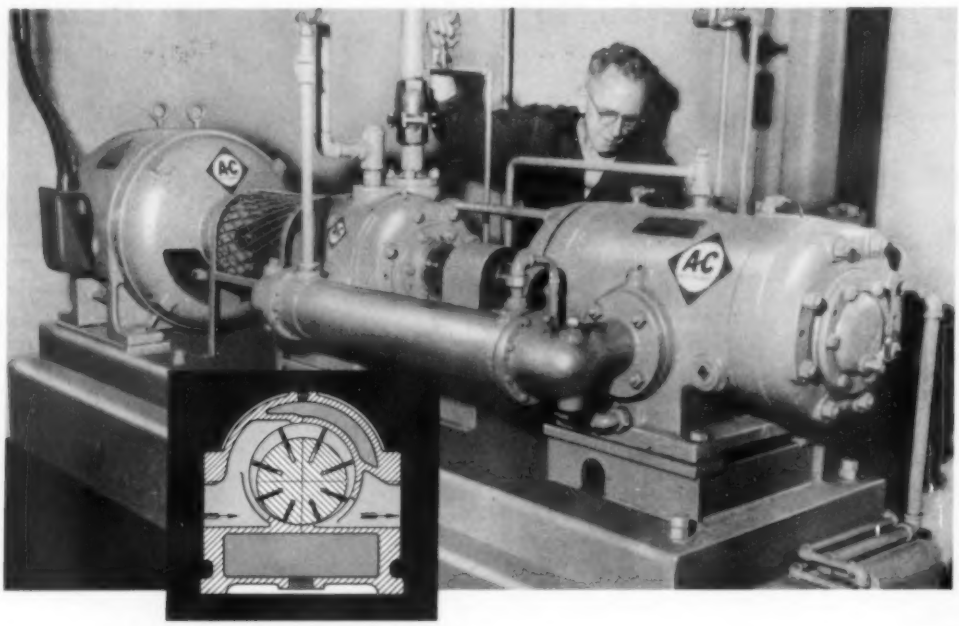
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5287

RO-FLO

Compressors cut vibration . . . eliminate wear and tear



Low maintenance is one of 4 advantages

ROTARY motion and fewer parts reduce maintenance costs to a minimum. Lack of vibration and shock, plus the absence of reciprocating parts — pistons, valves, connecting rods — eliminates major causes of trouble.

Other advantages are:

Constant efficiency — During operation the sliding vanes of the rotor press outward against the cylinder wall to form air cells (as shown in drawing). The rotating force holds vanes tightly against the cylinder wall under all conditions, and air cell size, air flow, and efficiency always remain constant.

Compactness — No extra weight or size needed to dampen vibration.

Low-cost foundations — Smooth operation eliminates need for heavy, costly foundations. Small units are bolted directly to floor . . . large units need only a simple slab.

Many Types and Sizes

Single-stage units for pressures to 50 pounds gauge, and volumes from 42 to 3245 cfm. Two-stage units for 250 to 1800 cfm at pressures from 60 to 125 pounds gauge.

Single and two-stage vacuum pumps for vacuums to 0.3 inch mercury absolute from 22 to 5950 cfm.

For Information — Call your nearby A-C office or write for Bulletin 16B8244 (two-stage) and 16B-8126 (single-stage). Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

Ro-Flo is an Allis-Chalmers trademark

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5354

Quick check on API chain quality:

Look at pins and bushings

Note the matched, satiny surfaces on alloy steel pin *and* bushing. *Grinding* the inside and outside of the bushing, as well as the pin, to a fine micro-inch finish helps assure long chain life.

LINK-BELT grinds both —eliminates wear-producing surface irregularities

FOR true chain precision and maximum endurance, appearance grinding is not enough. In the machining of pins and bushings for Link-Belt API chains, nicks and tool marks which may be starting points of fatigue are eliminated. Then, too, Link-Belt cadmium plates the pins to prevent rust and to avoid corrosive fatigue in these flexing members. These cadmium-plated pins go into service in factory-finish condition no matter how long the chain is stored.

Link-Belt API (SS type) chains have unequalled distribution throughout the oil country . . . and distributors are backed up by strategically located Link-Belt warehouses. These leading supply stores can show you why Link-Belt API chain is first choice in the field. And ask for a copy of Catalog 2680 on the broad Link-Belt line of oil field equipment. Or call your nearest Link-Belt office.

3 of many "EXTRAS" you get as standard on Link-Belt API chain

SHOT-PEENED rollers hammered by steel balls have added impact resistance.

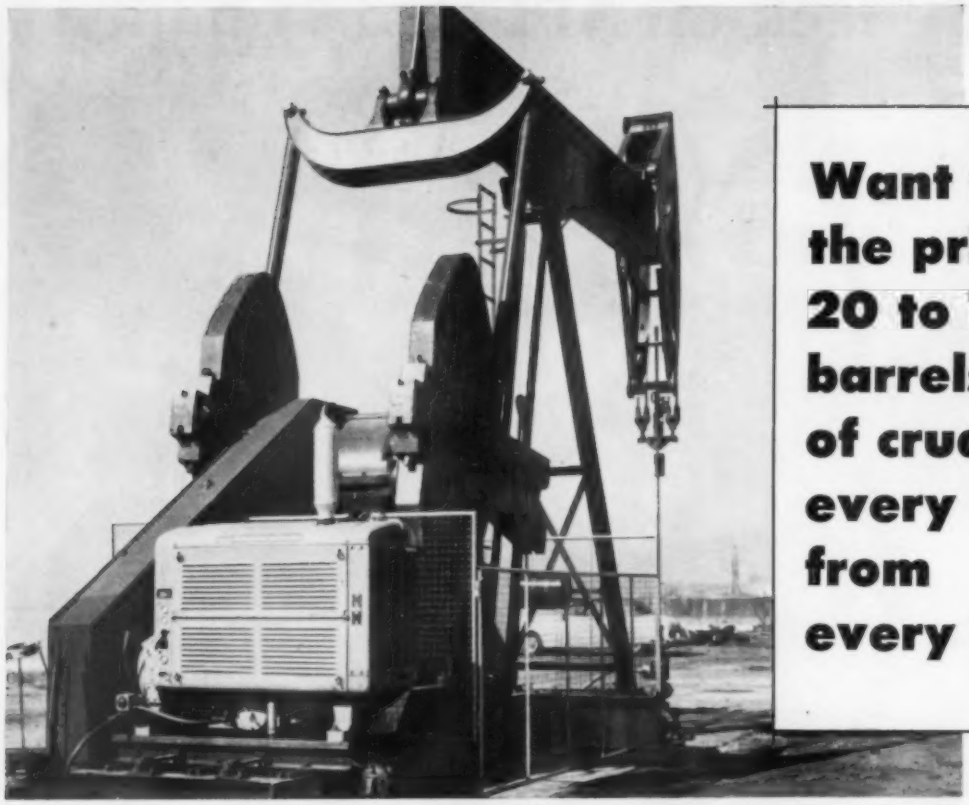
COTTERS with patented grooved shank fit tightly in pin hole. Pin is easily removed.

MORE CONVENIENT. Dust-proof, sturdy boxes simplify handling, identification.

LINK-BELT

CHAINS AND SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14.075



Want to save the price of 20 to 100 barrels of crude . . . every month from every well?

IF YOU PUMP EXTRA BARRELS TO PAY POWER AND STANDBY CHARGES IT'S TIME TO SWITCH TO

MM GAS-FUELED ENGINES

OILFIELD MODELS NOT SHOWN
MM 206H-4A, 4 cyl.
MM 283-4A, 4 cyl. MM 425-6A, 6 cyl.

Actual cost comparisons show that producers pumping with gas-fueled engines save the equivalent of 20 to 100 barrels of crude a month over wells pumped by electric motors. At $2.00 a barrel, that's an *extra* profit *from every well* of up to *$200.00 a month !*

Figure it for yourself! Compare a natural gas cost of 15c per MCF as against an electric power rate of 1c per KWH. Compare maintenance costs established by operators on electric and natural gas installations. Your own figures will prove gas-fueled engines are the most profitable pumping power you can use!

Minneapolis-Moline long-run design helps you get the maximum in gas engine economy. Large piston displacement, moderate rpm, vacuum crankcase ventilation, thermostatically-controlled by-pass cooling, and Thermo-Clad base pans for top-to-bottom temperature control give you the all-time low in pumping costs.

Pocket the price of 20 to 100 barrels of crude—contact your MM oil field distributor. Ask for complete performance data on the nine MM natural gas engines ranging 20 to 150 hp.

INDUSTRIAL POWER DIVISION

MINNEAPOLIS-MOLINE Minneapolis 1, Minnesota

THE GOLDEN POWER LINE

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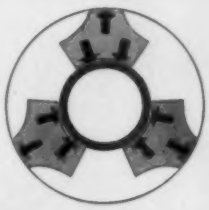
Tel. EMpire 5-2300

DEPENDABLE - DURABLE - PORTABLE

Guiberson's Type H Tubing Spider
for medium and shallow wells

Optional plain gate



Slips make 3-point contact with bowl and tubing — give a smooth, tight grip without crushing the tubing or sticking in the bowl.

Here's a tubing spider so easy to operate you can release it with a single hand or foot, leaving hands free for other work — designed so one man can carry it — yet so rugged and husky it does a job on medium or shallow wells.

Perfectly balanced slips, with segment-insert teeth, make running tubing almost a pleasure with the Type H. Teeth prevent rotation of tubing either way — no need for back-ups. The Type H spider is equipped with a guard gate to prevent damage to slips by elevator. Plain gate, still lighter in weight, is optional at same price.

Crews tell us that they like the Type H tubing spider's new light weight — like its smooth, fast operation — like its segment teeth. The full set of 12 segments is replaceable on the job, at about the same cost as resharpening conventional slips. And speaking of price, there's a lot more value in this spider than its low cost would suggest!

Get the Best — Get Guiberson.

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ESTABLISHED 1919
DALLAS, TEXAS
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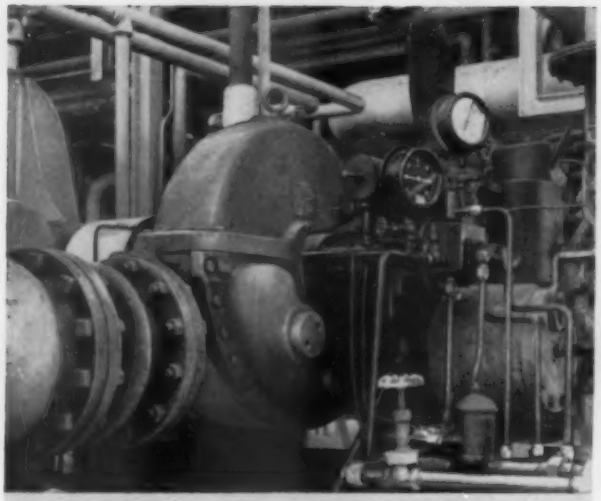
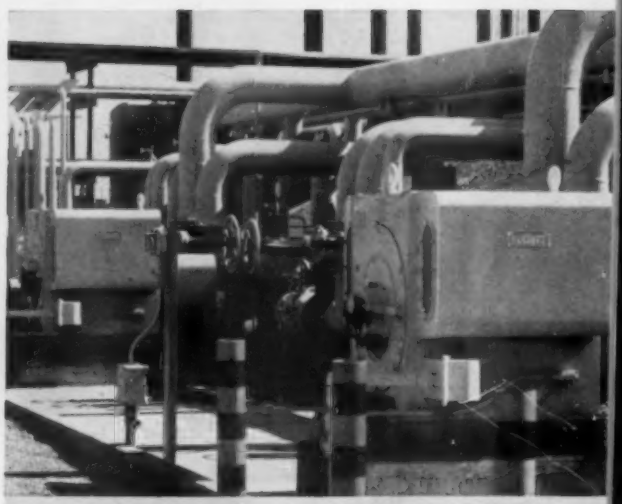
Sold by
Oil Field Supply Stores
Everywhere

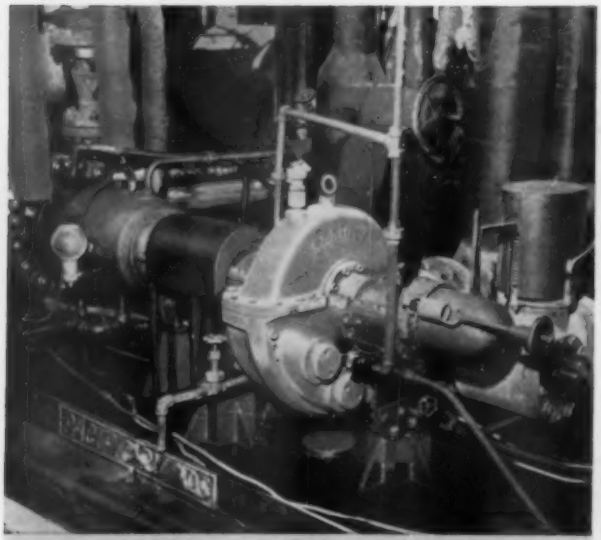
ELLIOTT serves



This Elliott 370-hp, 3240-rpm steam turbine drives a reciprocating compressor through a gear. The compressor serves a hydroformer unit.



These two Elliott 450-hp weather-protected outdoor motors, located in the bluff area near the docks, are used to drive centrifugal pumps which handle heavy naphtha from adjacent tankage.



One of eleven Elliott turbines driving centrifugal pumps at a lube oil unit.

Here an Elliott 8-in. twin strainer handles river water at a lube oil unit.

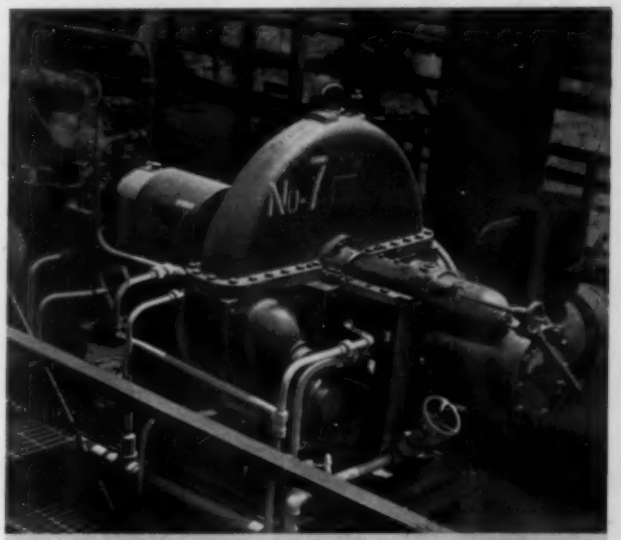
most versatile refinery

Esso Standard's Baton Rouge Refinery—producing more products than any other—is served by Elliott Turbines, Motors, Twin Strainers, Steam Ejectors, Deaerating Heaters

When this Esso Standard Oil Company refinery started operations in 1909, it processed 2000 barrels of crude oil per day into only three products. Now it converts 340,000 barrels of crude oil per day into over 600 products—a world's record in respect to number of products. It is also rated the largest refinery in the United States based on crude running capacity.

More than 100 Elliott steam turbines, ranging in size from 7 to 900 hp, are used in this refinery to drive all sorts of pumps, fans and compressors. Over a score of Elliott twin strainers, sizes 2 in. to 24 in., and Elliott steam jet ejectors serving vacuum units have been installed. Elliott 300-hp, 400-hp, and 450-hp motors are driving pumps and an Elliott 1750-hp, 1800-rpm induction motor is driving a centrifugal gas compressor. There are also four Elliott deaerating feedwater heaters.

Here is another dramatic illustration of how highest-quality steam and electrical products, manufactured by Elliott, serve leading industries. For information on how Elliott products can help you, call your nearby Elliott District Office or write Elliott Company, Jeannette, Pa.



Elliott Turbines, from small single-stage to large multi-stage types, assure highest-quality, long-term continuous service. This typical installation, operating on a 24-hour-a-day basis, is a 460-hp, 1750-rpm Elliott turbine which drives a river water booster pump. Bulletin H-228 describes the features which have resulted in the widespread use of Elliott YR turbines.

ELLIOTT Company

Q7-1

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

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Revolutionized Drilling

WILSON

AIR TUBE DISC CLUTCH

Another Sensational Feature

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WILSON RIGS!

The WORLD'S BEST Clutch on the WORLD'S MOST SENSATIONAL drilling rigs . . . that's WILSON! Wilson revolutionized drilling because they were the FIRST to use ONLY ONE TYPE OF CLUTCH ON ALL DRIVES . . . the WILSON AIR-TUBE DISC Clutch. This clutch is longer lasting . . . the most powerful and foolproof . . . and offers absolutely the fastest and smoothest engagement and disengagement of any air clutch. WILSON AIR-TUBE CLUTCHES are used on each Wilson rig! Count the air clutches on *your* rig, then compare . . . It can *ONLY* be a modern rig if it's a WILSON!

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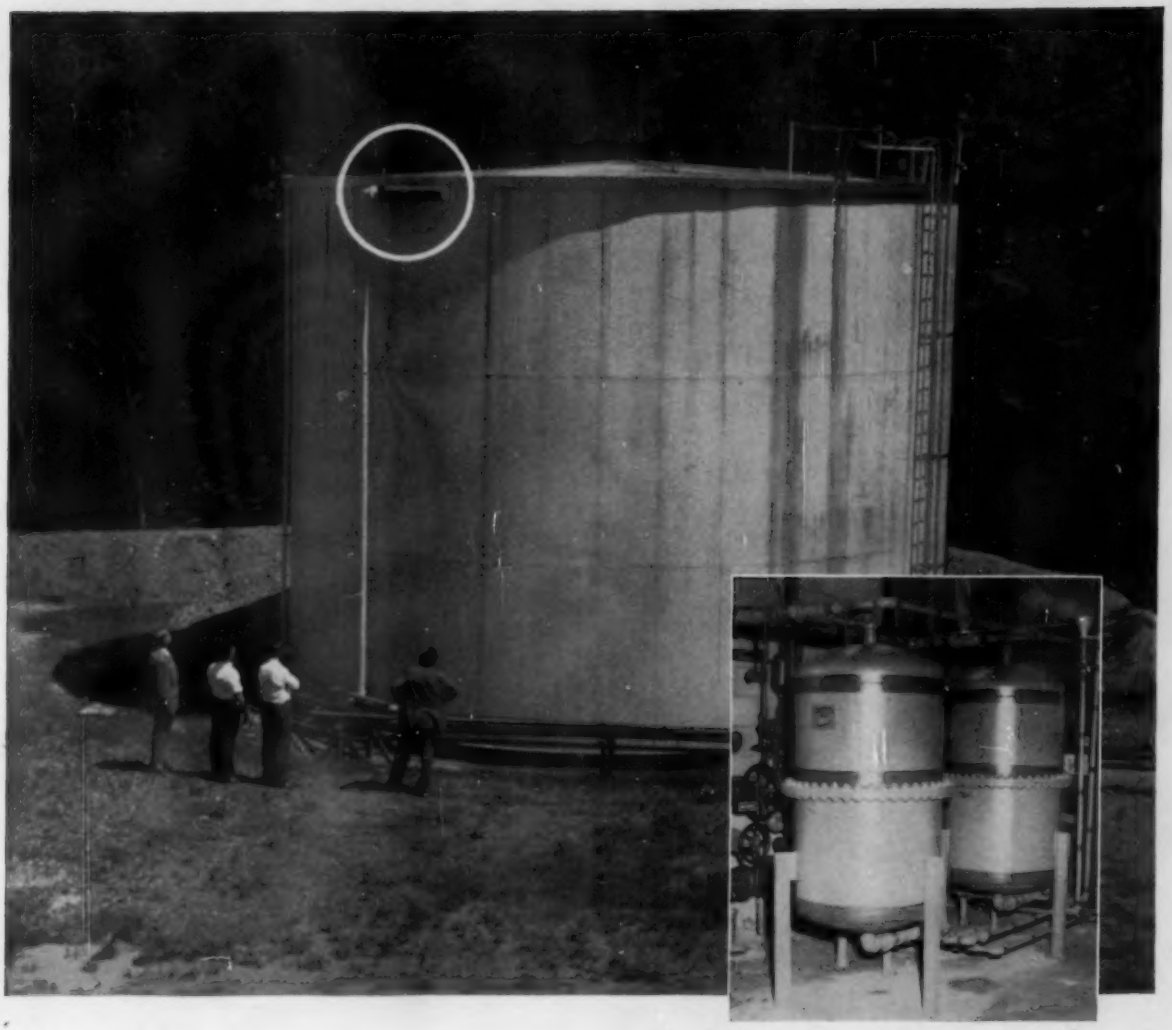

A blanket for this big baby?

Sure . . . it's in the two little tanks . . . a blanket of Foam

The big tank is full of Styrene, great stuff for the plastics business.

A Styrene fire out of control, like any fire, can be dangerous. The best way to fight it? Throw a blanket of Rockwood FOAM over it.

On top of this big baby full of Styrene is the business end of a Rockwood Fixed FOAM System (in the circle). It'll throw a FOAM blanket over the tank in seconds — if a fire ever starts.

The FOAM liquid is kept, ready to go any time, in the Rockwood diaphragm-type storage tanks on the right.

Do you have a baby like this — full of some flammable liquid? Is a Rockwood Fixed FOAM System ready with a blanket — just in case? Use the coupon to send for the informative booklet.

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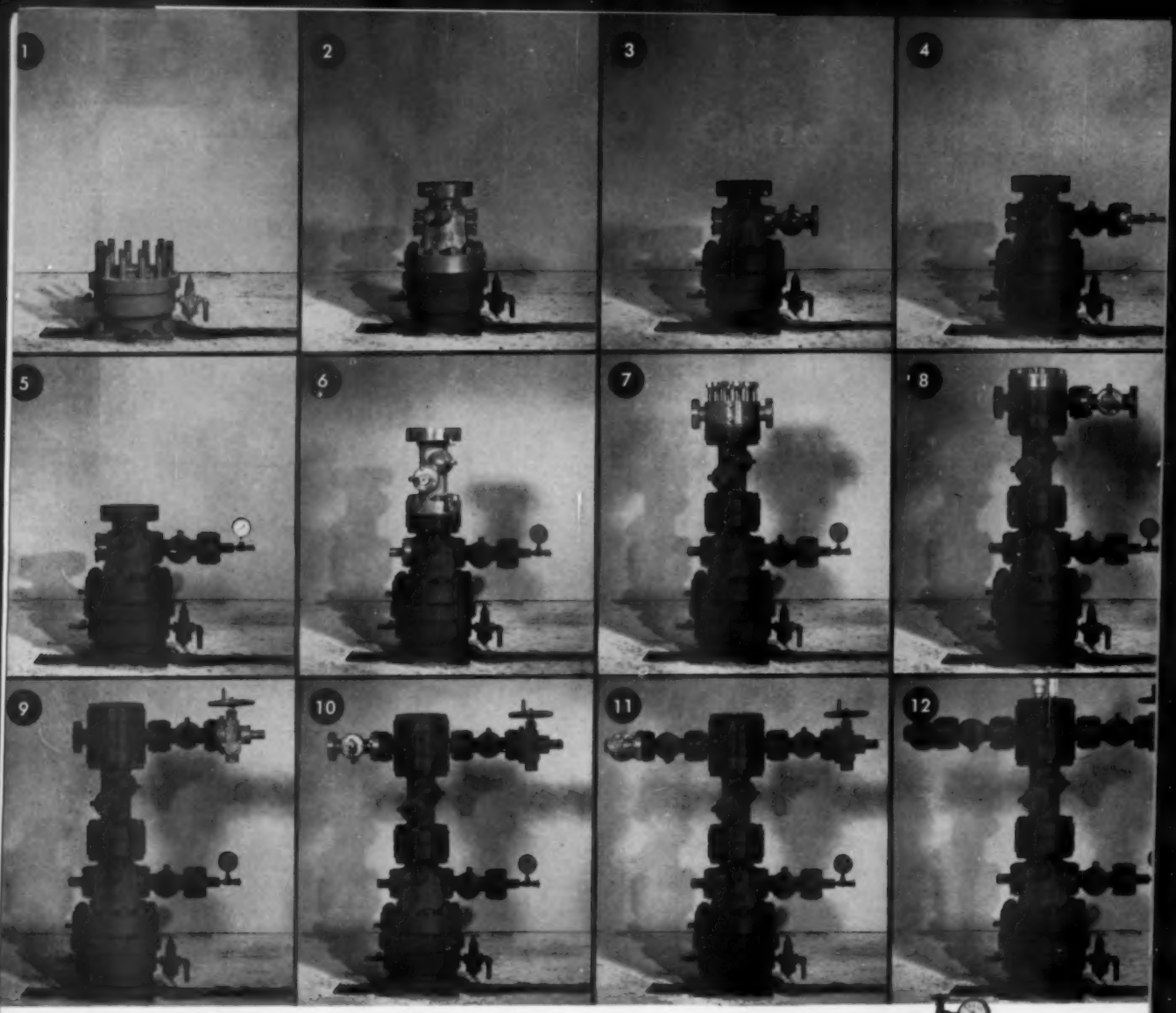
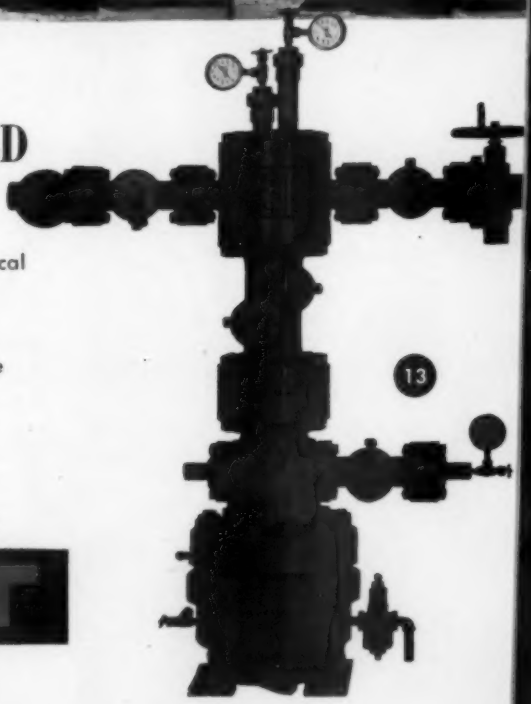


"STEP-BY-STEP STORY" of the BEST DUAL ASSEMBLY IN THE FIELD

From the first bolt to the last gauge, the dual tree shown above in the various stages of growth, represents the most practical and efficient dual well control equipment in the field.
It is an O-C-T Dual Tree, including the new and revolutionary O-C-T Universal Tubing Head.
Dual assemblies, pioneered by O-C-T and now improved to give you even greater versatility, answer long existing problems.
For deep or shallow multiple pay zones... if you make any kind of dual completion... make it O-C-T, the pioneer and leader in dual completion equipment.



OIL CENTER TOOL CO.

Houston, Texas

O·C·T

New BJ Service 111-TA Cementing Units

High Volume Cementing At New High Efficiency

510 hp...56 cfm slurry...10,000 psi rating...all combined for your benefit!

1. **Diamond T Cab-Over Design** gives best equipment arrangement for optimum efficiency.
2. **Gardner-Denver Cementing Pump,** 4½ x 8 triplex, 10,000 psi rating, newly designed for high-volume service.
3. **Gardner-Denver Mixing Pump,** 4½ x 8, 3,000 psi rating, supplies water to mixer, provides annulus pressure, and may be used for added displacement of slurry.
4. **Rugged 335 hp Truck Engine** also drives cementing pump.
5. **Deck-Mounted 175 hp Engine** drives mixing pump.
6. **Displacement Tank,** 200 cu. ft., two compartments.
7. **Suction Manifold** permits fluid withdrawal from either or both tank compartments to either or both pumps.
8. **High Pressure Discharge Manifold** provides extreme flexibility of hook-up. Each pump has individual discharge line, and both pumps may discharge through a single line. With both pumps in tandem a displacement rate of 96 cfm is attainable. Annulus may be pressured to 3,000 psi while squeezing slurry at 10,000 psi by a single pump truck and one operator. Time for reversed circulation is minimized by advanced manifold design.
9. **Hose Equipment.** Fifty-four feet of 2" steel discharge hose and 50 feet of 2" steel line with unions.
10. **Multi-Jet Mixer**—provides a pre-set slurry consistency from the first sack. No "hunting" for the correct slurry weight.

WRITE today for illustrated bulletin, or contact your nearest field service office.

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Stations Throughout California, Rocky Mountain and Permian Basin Areas

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If you need it right on time . . .

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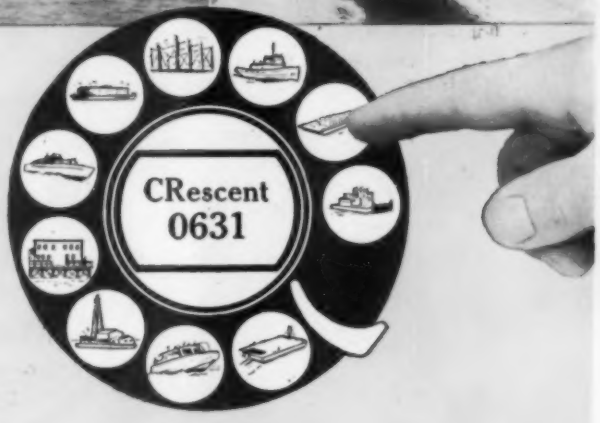

7 YEARS WITHOUT OVERHAUL

Since he installed GM Detroit Diesel Power

How's this for a steady on-the-job record? Olin Sharp, of Evansville, Indiana, reports that after seven years' operation, with frequent moves, his two General Motors Detroit Diesel "Twin 6-71's" still give "like-new" performance. He says, "Their fast acceleration reduces lost time in making round trips and the low operating costs mean savings to us."

GM Detroit Diesel 2-cycle engines are powerful—pull more pipe—pump more mud—make more hole. They are compact—can be moved quickly and easily from one site to another. They can be depended on to get the job done fast without costly downtime. And they are promptly serviced by GM Detroit Diesel distributors and dealers everywhere.

Single and multiple engine units are available in a wide horsepower range for almost any petroleum application. Write us or ask your nearest GM Detroit Diesel distributor for new 16-page illustrated catalog "GM Detroit Diesel Petroleum Engines." It will help you choose the right power for *every* oil field job.

GM DETROIT DIESEL POWER

DETROIT DIESEL

Engine Division of General Motors, Detroit 28, Michigan

REGIONAL OFFICES: New York, Atlanta, Detroit, Chicago, Dallas, San Francisco

Factory Engineered Parts—
Factory Trained Servicemen Everywhere

Two GM "6-71" Diesel Twins, drive Ideco draw works and Gardner-Denver pump, for Sharp Drilling Co., Evansville, Ind.

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GENERAL MOTORS DIESEL LIMITED
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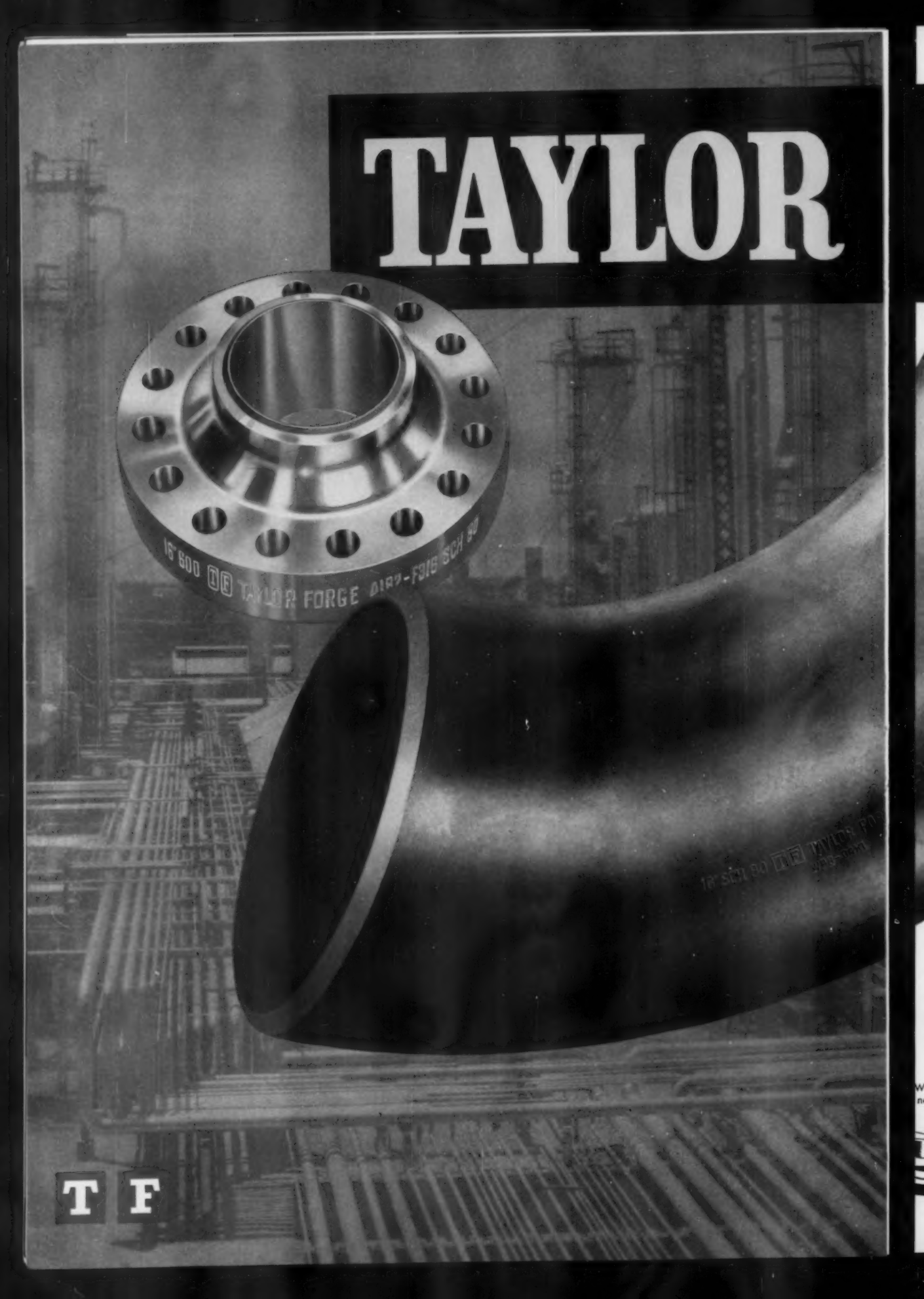
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Quality in welding fittings and forged flanges is many things. It is engineering exactitude and manufacturing integrity translated into flawless metal expertly formed, forged, shaped. It's that hard-to-define ingredient which assures dependability . . . always . . . under all conditions. It is something that only experience can produce. And it is the combination of these elements that makes quality conscious buyers

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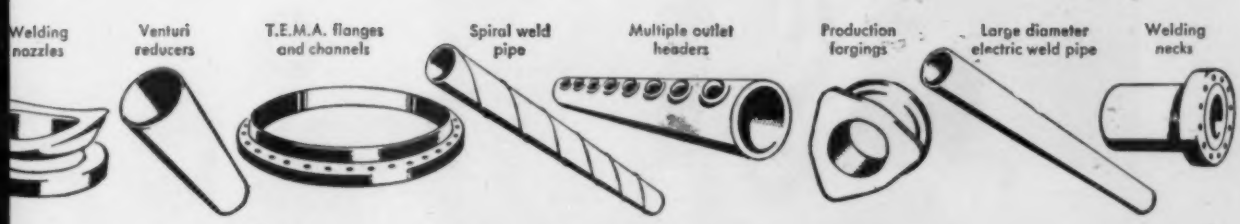
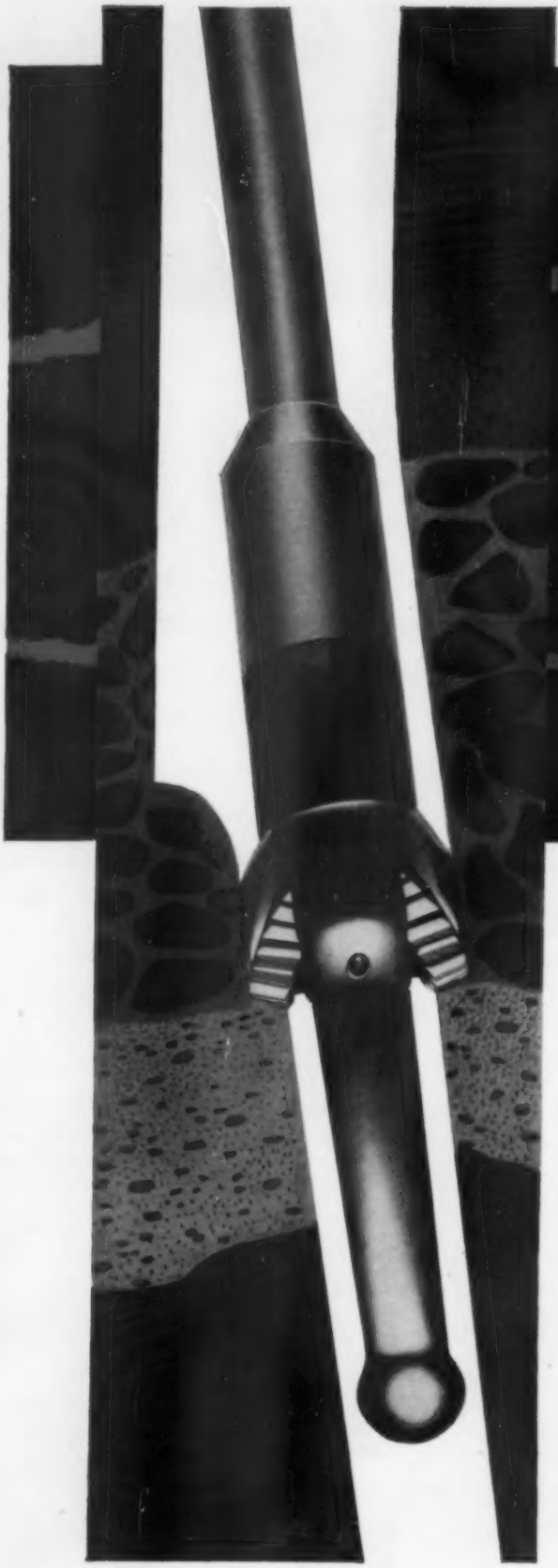
He carries a full stock of Taylor Forge Welding Fittings and Forged Flanges. And he is as near as your telephone. His organization is efficient and reliable and through him you have available the services of Taylor Forge engineers for advice and counsel an any piping problems.





The Best Tool for Reaming Whipstock or Knuckle Joint Pilot Holes to Full Gauge!

EASTCO

2 CUTTER HOLE OPENER

DESIGNED EXPRESSLY FOR DIRECTIONAL DRILLING OPERATIONS

ANOTHER EASTMAN SUPERIOR SERVICE

The best tool for reaming whipstock or knuckle joint pilot holes to full gauge — or for opening core holes!

The body and solid ball guide is a single, nickel alloy steel casting of great strength. The roller bearing 2-cutter assembly is easily and quickly changed on the job. The 2-cutter also allows greater strength. *No welding is necessary.*

The ball guide centers the tool and prevents side-tracking the hole; and the flat sides help find rat hole. Jet action circulation directed ahead of both cutters insures fast efficient operation.

Available in popular size ranges from 6" through 12¼".

So successful and popular has it become that it is now standard equipment throughout the world with hundreds of efficiency-wise operators . . . MAKE IT YOURS!

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EASTMAN OIL WELL SURVEY COMPANY
LONG BEACH DENVER HOUSTON

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Exclusive Export Agents
P. O. BOX 1500 DENVER, COLORADO, U.S.A.

IT TAKES Muscle TO DIG DEEP

If ever a machine had muscle, it's Bethlehem's big 1013 drawworks. Here's a rig designed for deep-hole drilling—a rig with power. Great *reserves* of power that give it complete mastery over the long strings of drill pipe.

The 1013 won't sputter and strain under load. Its parts are built for punishing service, with plenty of margin for safety. Among its many features are extra-capacity clutches, extra-heavy shafts, unusually powerful water-cooled brakes, and husky roller bearings. Good lubrication is assured by the always-dependable force-feed and pressure-grease systems.

The rig is equipped for three rotary speeds, six hoisting speeds. In the matter of drives, exceptional latitude is possible: you have your choice of mechanical power take-offs, hydraulic couplings, torque-converters, or electric couplings. The drive arrangement can be furnished for any number of prime movers, and with one or two pump drives, or without pump drive.

These are but a few of the highlights. The 1013 has numerous others, and they are features you should know about. If you will call our nearest office, we'll be glad to give you the story in full detail.

BETHLEHEM SUPPLY

BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla. *West Coast Headquarters:* Los Angeles, Calif.
Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York, N. Y.

UNIBOLT
flow manifolds

More and more operators are requesting their Christmas tree supplier to furnish UNIBOLT Flow Manifolds because they are lighter in weight, stronger, economical and easier to maintain.

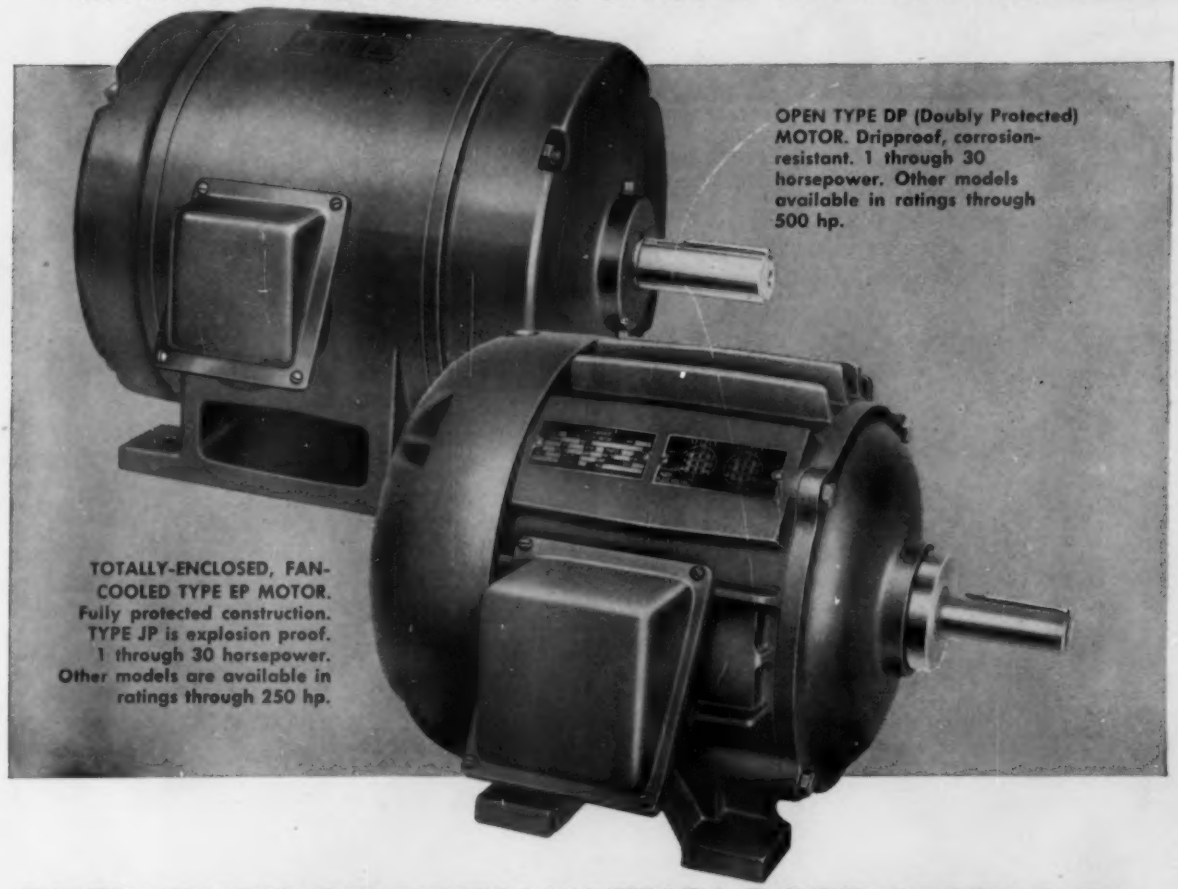
Employing standard UNIBOLT connections rather than flanges, the UNIBOLT Flow Manifold is many pounds lighter, yet the UNIBOLT design, which places more steel in shear, actually results in a higher factor of safety for the manifold.

The three parts of the manifold — UNIBOLT Tee or Cross, Adjustable Wing Valve, and Positive Choke Body — are pressure-tested as a unit and may be assembled in a number of combinations to best meet individual needs. They are furnished in regular forged steel or in high-chrome alloy for corrosive wells — 6,000, 10,000 and 15,000 lbs. test.

The manifold is completely salvageable, either as an assembly or as individual units. Since all of its connections are standard UNIBOLT design, each unit freely interchanges with any other UNIBOLT product of the same size and rating.

THORNHILL CRAVER CO.
P. O. BOX 1184 **HOUSTON, TEXAS**

WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY


OPEN TYPE DP (Doubly Protected) MOTOR. Dripproof, corrosion-resistant. 1 through 30 horsepower. Other models available in ratings through 500 hp.
TOTALLY-ENCLOSED, FAN-COOLED TYPE EP MOTOR. Fully protected construction. TYPE JP is explosion proof. 1 through 30 horsepower. Other models are available in ratings through 250 hp.

OPEN TYPE OR TOTALLY ENCLOSED MOTORS...

Wagner offers MORE for your motor dollar!

- **MORE POWER IN LESS SPACE**... These motors are built in NEMA frame sizes 182 through 326 U. They pack more power into less space for easier handling and stocking—require less space for installations.
- **CORROSION-RESISTANT FRAMES** ... Both types are built with rugged, corrosion-resistant cast iron frames. Motor feet are cast as an integral part of the frame for maximum strength and rigidity.
- **THE TYPE OF PROTECTION YOU NEED**... Type DP motors have completely dripproof—virtually splash-proof enclosures; while type EP is totally enclosed, fan-cooled for complete protection; and type JP adds explosion proof features.
- **COOLER OPERATION**... Special baffles direct a cooling flow of air through the DP motor. Types EP and JP are fan-cooled and have ribbed frames to increase the surface area for more efficient cooling.
- **LONGER BEARING LIFE**... These motors can be re-greased when desired to prolong bearing life. Fresh grease can be added—old grease removed through openings provided in the bearing housing.
- **WAGNER DEPENDABILITY**... These two motors have the same high Wagner quality, will give the same long life performance, that have made Wagner Motors a *known* value for sixty-five years.
- Let a Wagner field engineer, expert on motor applications, show you how these motors can be applied to your needs. Call the nearest of our 32 branch offices, or write us. Bulletins MU-202 and MU-203 give complete information on these Wagner Motors. Write for your file copies today.

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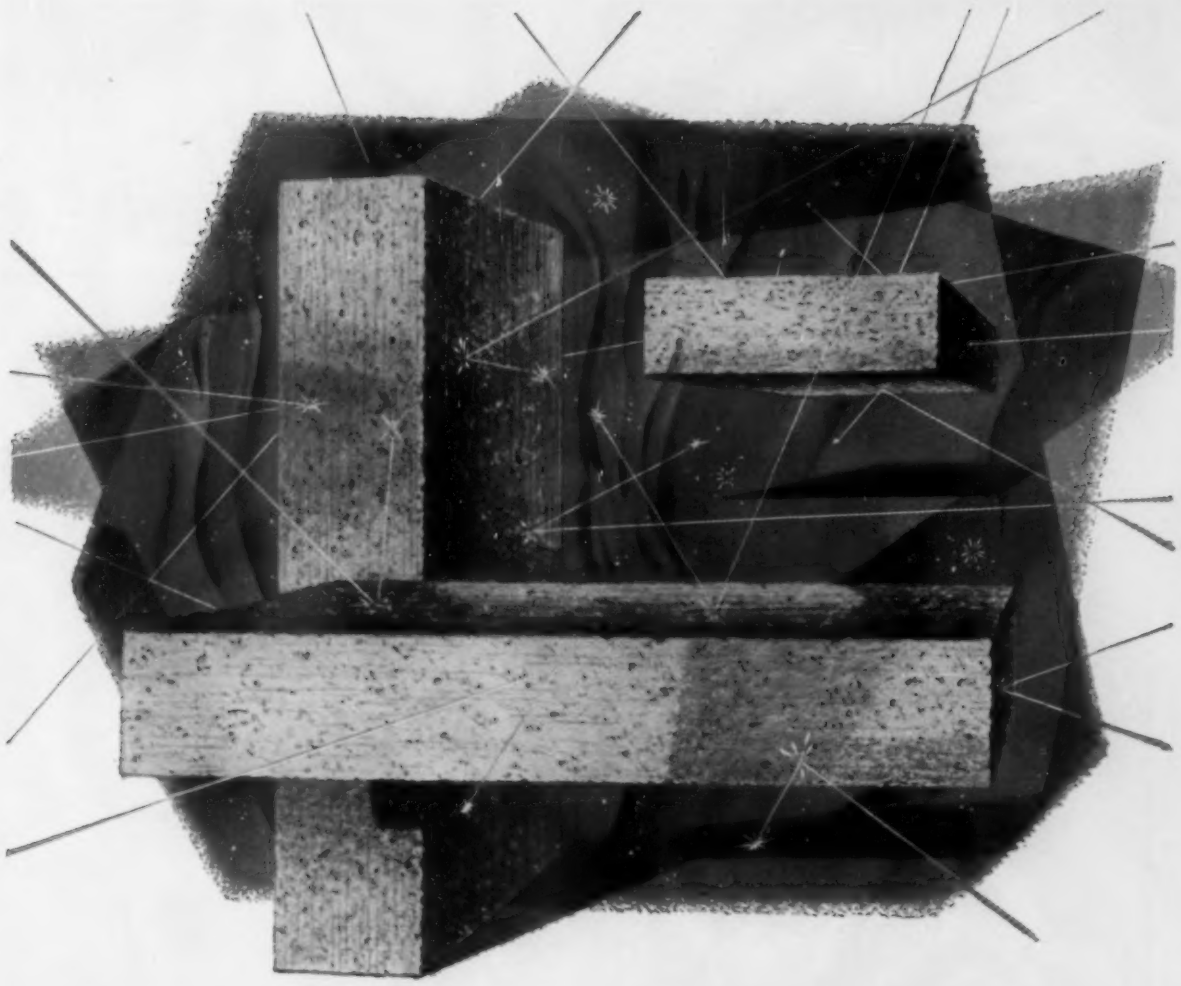

Go ahead! Raise process temperatures

. . . refractories fortified with Alcoa Aluminas can take it

Process temperatures continue to climb in industry's constant effort to raise production and product quality while cutting costs. That makes more important than ever the role of ALCOA® Aluminas in fortifying refractories. To see why, study these performance facts:

As alumina content of a refractory increases . . .

- **strength and stability under load at high temperatures increase**
- **there is less spalling, abrasion and fluxing**
- **co-efficient of expansion decreases**
- **resistance to chemical attack improves**
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For users of high alumina refractories, the money-making results are these: less downtime . . . less rebuilding . . . longer continuous equipment operation under uniform conditions to raise production tonnages and maintain product quality . . . easier product development.

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ALCOA does not make refractories! We will gladly refer you to a reliable supplier who uses ALCOA Aluminas to make *better* refractories. For additional information, write ALUMINUM COMPANY OF AMERICA, 904-D Alcoa Building, Pittsburgh 19, Pennsylvania.

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TELEVISION'S FINEST LIVE DRAMA
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A 7500-foot Tiger Brand line was used on this rig and was cut back 69 feet each time to get maximum service from the rope.

gets heap big run

of 120,000 ton-miles from one 7500-foot Tiger Brand Wire Rope

Joe Blackman, American Wire Rope Specialist, and E. J. Stufflebeam, tool pusher, check a piece of wire rope for wear after the 120,000 ton-mile run.

Drilling was tough in this area and vibration severe, but the Tiger Brand lines withstood it without trouble.

This is the best ton-mile record made in the Eola Field according to Mr. E. J. Stufflebeam, tool pusher on the Big Chief Drilling Company's Rig No. 29 in Garvin County, Oklahoma. He goes on to say, "I've run experiments on various lines, including high strength, but we've got better runs from Tiger Brand than any other ropes we ever used. One reason is that American Steel & Wire sends a field man around who checks what is happening and offers good suggestions on how to improve wire rope life."

The wire rope used on this rig was American Tiger Brand, 1¼-inch, 6x19 Monitor Excellay with wire core . . . the best drilling line you can buy. Write for complete information.

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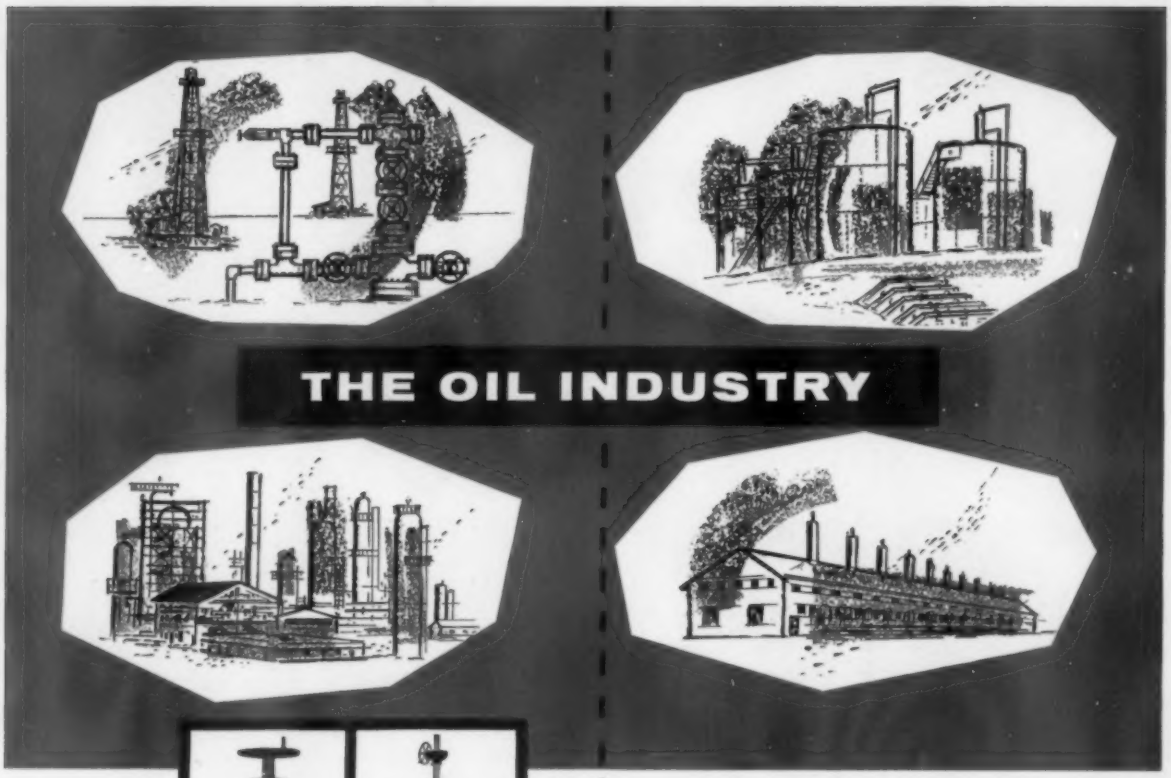

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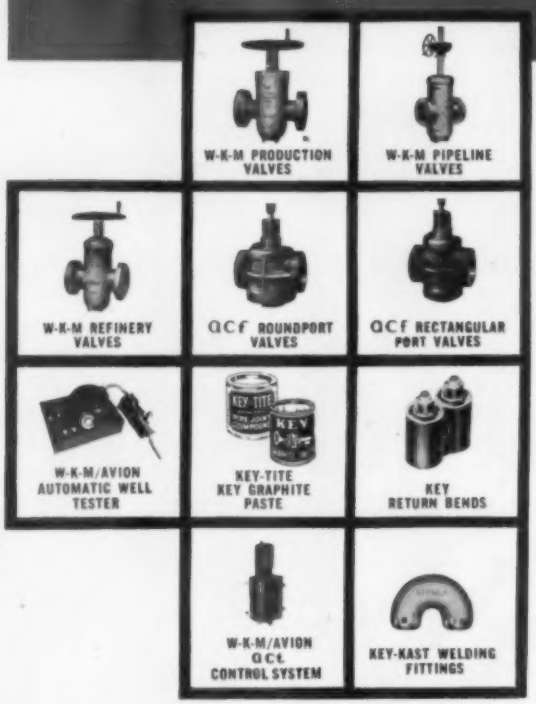

and W-K-M

These W-K-M products with a world-wide reputation for quality and service are used in all phases of the industry—

At the well— W-K-M through-conduit gate valves are used on christmas trees, flow wings, and high pressure flow lines.

In the field— ɑcf rectangular and round port lubricated plug valves are used on manifolds, headers, and flow lines serving field processing units.

In refineries, gasoline and petro-chemical plants— W-K-M valves are used on high pressure, high temperature product lines; ɑcf valves on service lines handling a wide variety of commodities; KEY return bends are used in furnaces and heaters, and KEY-KAST alloy steel welding fittings are used where tees, wyes, ells, and other shapes are required.

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In distribution— ɑcf valves are used in gas storage and distribution systems serving homes and industry; KEY-TITE and KEY Graphite paste joint compounds are used on lines handling such products as water, steam, natural and artificial gas.

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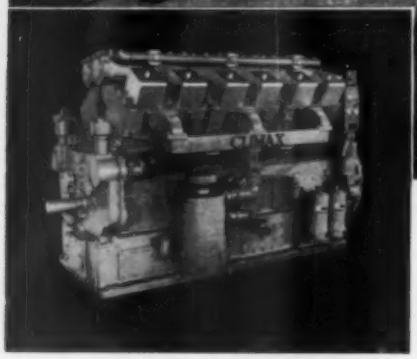

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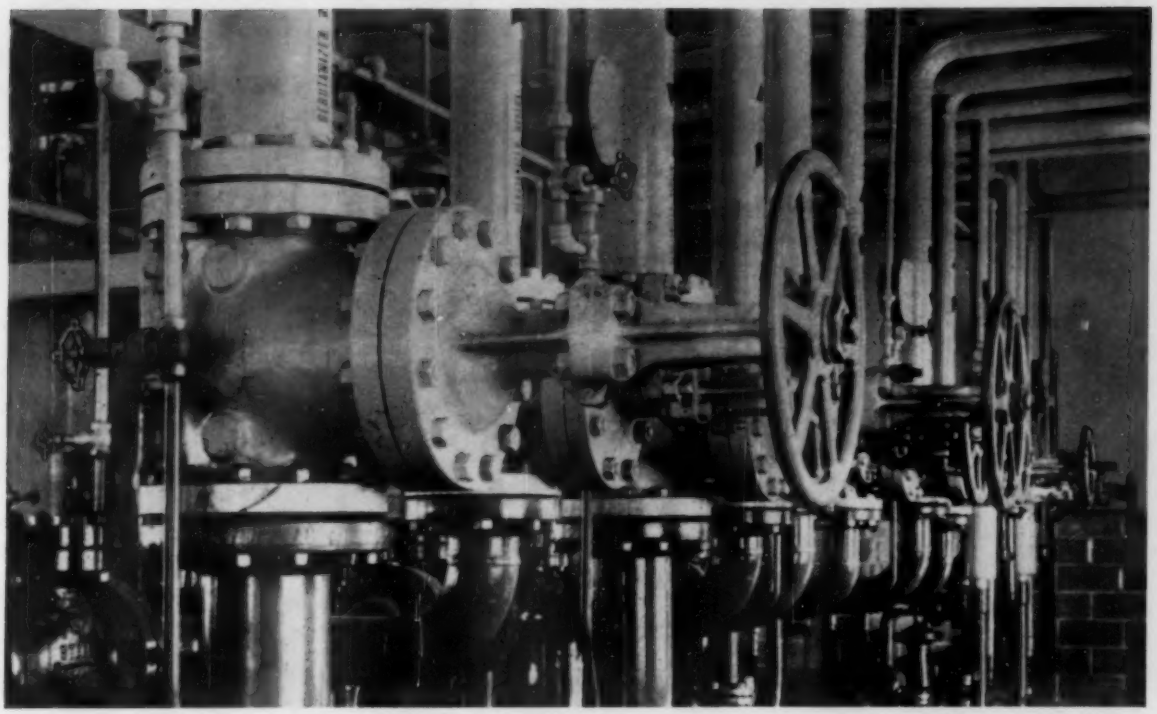
Maintenance costs can gobble up your savings in a few months!



LUNKENHEIMER QUALITY is no longer a luxury—it's your vitally needed insurance against today's sky-high maintenance expense. Labor rates are going still higher . . . "downtime" costs are multiplying . . . repair charges are rocketing up—with no relief in sight. Today, it pays to buy the *best valves you can get,* with no hedging on quality. Your purchase of Lunkenheimer Steel Valves is an investment that pays worthwhile dividends in maintenance savings . . . year after trouble-free year. The Lunkenheimer Company, Box 360, Annex Station, Cincinnati 14, Ohio.

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See and drive these newest INTERNATIONALS *today!* International Harvester Company, Chicago.

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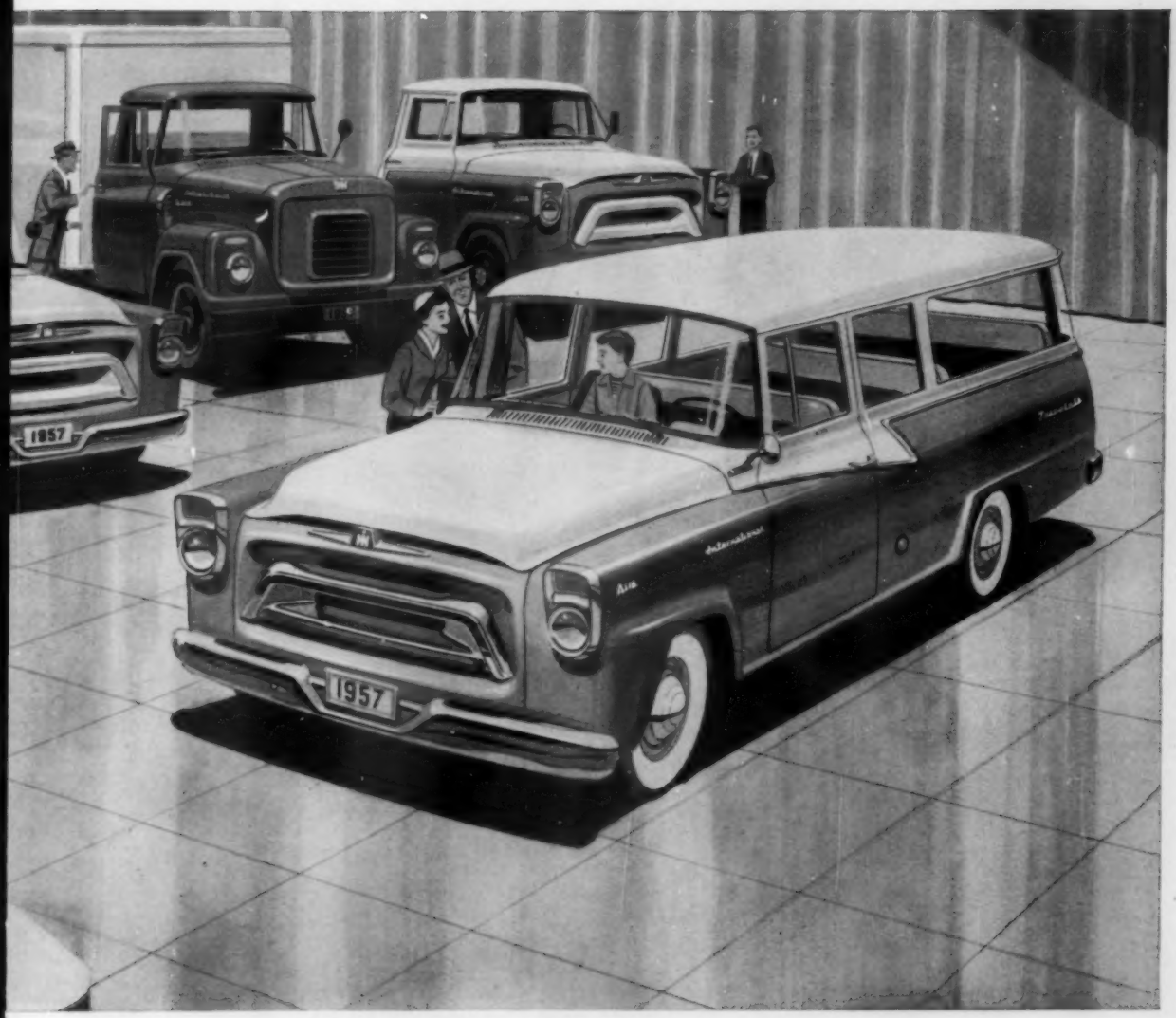

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DELIVERS MORE HYDRAULIC HORSEPOWER .....

..... PRODUCES GREATER FRACTURING EFFECTIVENESS

Engineered for greater fracturing effectiveness—Western's exclusive FOUR-INCH TREATING LINE frac hook-up delivers greater hydraulic horsepower to your well.

The four-inch treating line minimizes loss of horsepower due to friction between pump discharges and well head, and eliminates hazardous line vibration. A single four-inch line may replace up to 10 two-inch lines. Faster hook-up is attained, and numerous line connections are eliminated.

Western's frac hook-up is engineered to produce the greatest fracturing efficiency possible. The Fracmaster 600—most efficient* frac unit in the field, the common-manifold tank discharge system, and the exclusive electronic pressure recorder team with the four-inch treating line for greatest fracturing effectiveness.

Get the many advantages of Western-engineered fracturing and the other services of the Western integrated program—radioactivity logging, jet perforating, and acidizing. Next time, GO WESTERN for

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*Average 78% efficiency certified by Pittsburgh Testing Laboratory.

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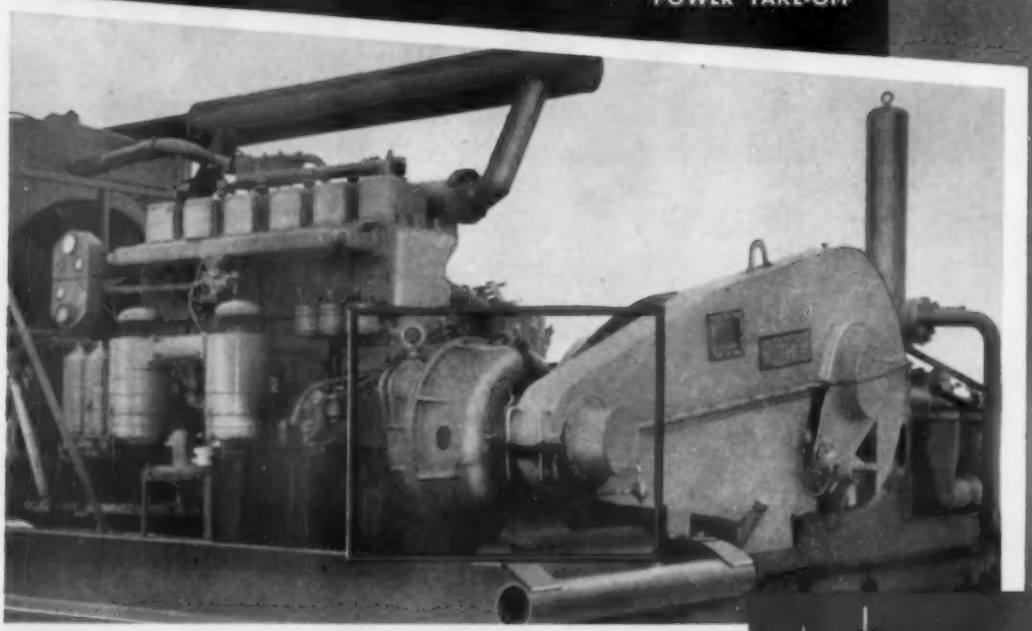
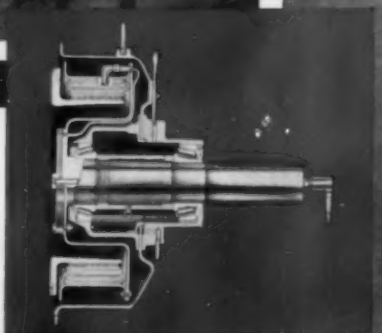
*POWER TAKE-OFF

Another Field-Proved Product Supplied by Mid-Continent



The air operated Fawick Power Take-Off provides an ideal shock-free independent pump drive and may be remotely controlled from the driller's position. Heavy duty bearings and rugged bell housing eliminate the need for pilot bearing or outboard bearing. The Fawick PTO offers dollar savings in initial installation too, because it requires no special adapters, skids or outboard bearings. It bolts directly to the engine flywheel and flywheel housing. V-belt or chain drives are easily installed or removed from the open end clutch shaft, speeding up rig-up time. For complete information on the Fawick PTO, contact your Mid-Continent representative. Mid-Continent stores, sales offices and sales representatives are located in all active oil areas.



Air operated Fawick PTO has self-adjusting CB air-flex clutch and rugged anti-Friction shaft bearings.

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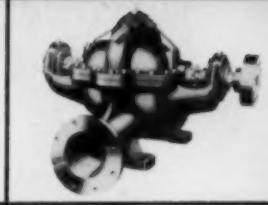

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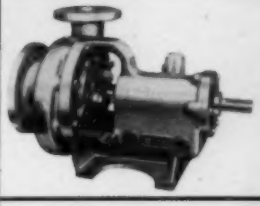

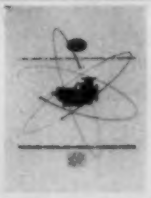

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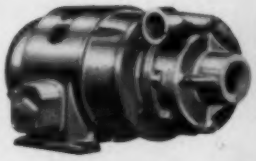
America's broadest line of economical, general purpose pumps. Horsepower range from ¼ to 150. Head range to 260 ft. Capacities up to 5500 gpm. Easy to buy, apply, install and maintain. Tens of thousands in use.



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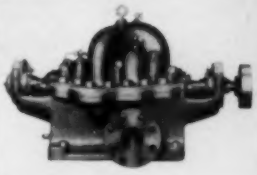
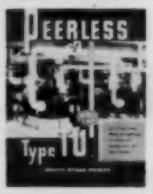
2,3,4 and 5-stage designs for supplying, circulating and boosting water and other liquids in moderate capacities against medium and high heads. Durable and dependable in operation. Heads up to 1660 feet; capacities up to 3000 gpm.





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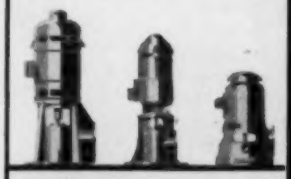

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- ☐ Type AS Bulletin B-1350
- ☐ Type DL-DM Bulletin B-1608
- ☐ Type PE-PB Bulletin B-2300
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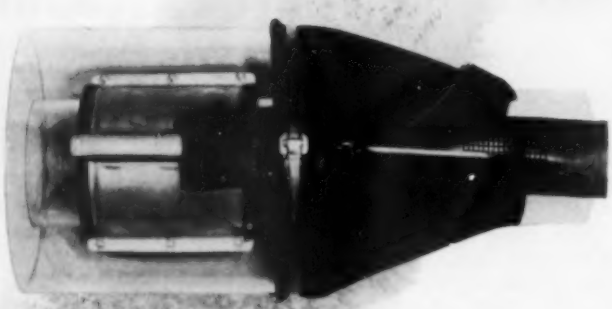
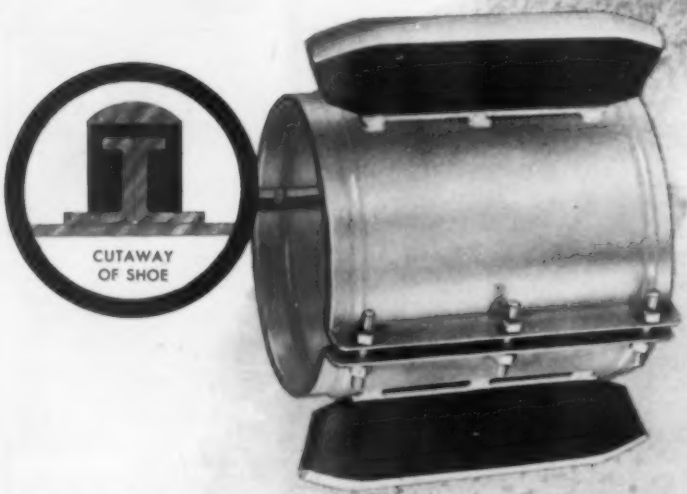
. . . FOR ANY JOB!

Maloney Zipper Type
Casing Seals

All neoprene used in the Maloney Seal (and insulator) is live resilient rubber. It is the best rubber that can be compounded.



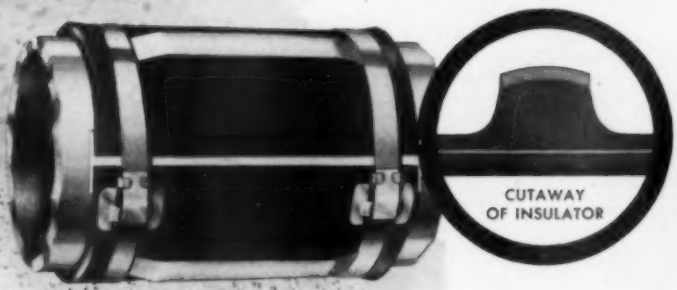


The Maloney Model 55 Crossing Insulator
For all Sizes of Pipe

These insulators have superior insulation qualities because of the low moisture absorption and the long life compounded into the neoprene. The wide steel, sled type runners make installation easy. The extra wide band affords a positive grip. Bonded metal-to-neoprene-to-metal, the runner insulates and also permits flexibility to compensate for pipe shifting. Ribbed neoprene lining can be furnished if desired.

The Maloney Model 56 Casing Insulator
Manufactured in sizes from 2" through 12"

Manufactured with neoprene, which is vulcanized to the steel band core and to the rounded steel runners, there is no place to "short-out" between the casing and the carrier line. The steel core is completely surrounded with neoprene and is bonded under heat and pressure to give the same strength as an army tank tread blocks.



"Something from the Irishman"

F. H. MALONEY Company

Houston, Texas

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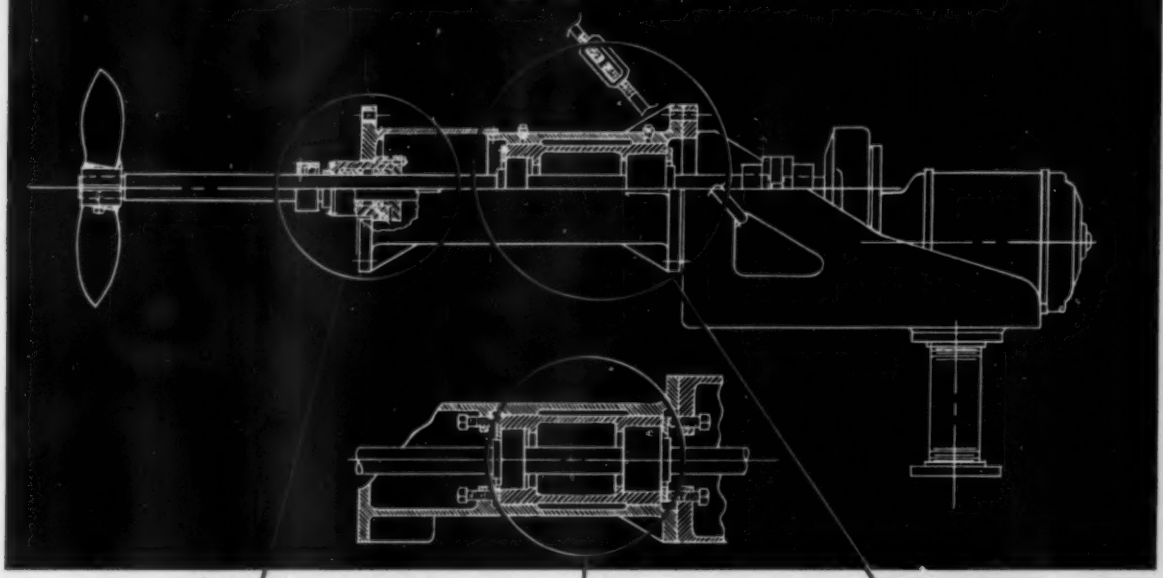
SINCE 1932 — PRECISION IN RUBBER — METAL — PLASTICS

announcing the new TURBO-MIXER side entering propeller series



Repackable Stuffing Box: standard in the sizes from 10 H. P. up, and obtainable in all sizes from 1 H. P., utilizing a special Turbo-designed positive seal mechanism.

Simplicity: only 2 bolts to turn to retract the bearing housing and apply the positive pressure to the sealing device, and only 2 bolts to turn and to return it to operating position. The gear-motor doesn't move an inch!

Retracting Bearing Housing: no pulling the shaft back through a bearing (which means a loose shaft-to-bearing fit). In the Turbo, the complete housing retracts, leaving the bearings untouched, in perfect shop-fitted alignment, keeps them that way.

Expertly designed, based on 44 years of specialized experience. The simple, sturdy design of this new series of Turbo-Mixers makes servicing easier, reduces maintenance costs. Models are available in standard sizes from 1 H. P. to 30 H. P. in two series, AD (direct drive) or AV (V-belt). All are available with a special mechanical seal which can be replaced while the tank is full.

TURBO-MIXER GENERAL AMERICAN

TURBO-MIXER DIVISION
GENERAL AMERICAN TRANSPORTATION CORPORATION

Sales offices: 380 Madison Avenue, New York 17, New York • General offices: 135 S. La Salle Street, Chicago 90, Illinois • Offices in all principal cities

FOR DETAILED INFORMATION AND USEFUL DESIGN DATA, SEND FOR THE FOLLOWING BULLETINS:

Please send me the following Turbo-Mixer Bulletin(s):

_____Side Entering Propeller Mixer Bulletin

_____RDC Extraction Column Bulletin

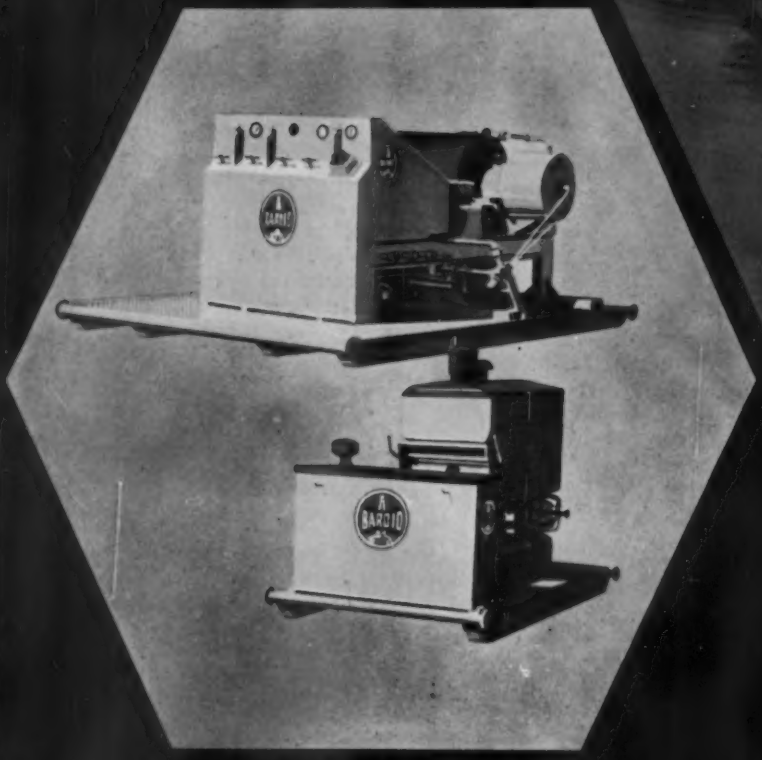
_____Minerals Processing Bulletin

_____General Turbo-Mixer Bulletin

NEW SERVICES . . . such as the "Mr. George" giant offshore delivery vessel now serving offshore Louisiana Gulf Coast rigs. Carries up to 1500 tons of mud materials per load.

BAROID

NEW PLANTS . . . such as the new Marine Terminal and mill at New Orleans. Baroid has increased its stockpiles of products at all important points.



NEW EQUIPMENT . . . such as the BAROID MUD CENTRIFUGE for discarding drilled solids and reclaiming mud weight materials. More than pays for itself in mud savings and ease of mud control.

TO GIVE YOU BETTER SERVICE . . . Baroid has increased its number of service centers, field personnel and distribution facilities. Baroid products and services are now more readily available than ever before, everywhere in the United States, Canada, Venezuela and offshore. There is no question of "can I get what I need" when you specify BAROID.

continues to set the pace for mud service!

NEW PRODUCTS . . . nearly a dozen new, field-proved mud products for fast, economical drilling. New lost circulation materials, surfactants, emulsifiers, thinners, anti-contaminants . . . each a champion in its class.

This year, as your drilling activity speeds up, you will find Baroid already prepared to meet your increased mud needs. Baroid foresaw your requirements and *now has in service* new plants, new products, new equipment and new services.

This is your proof that today's leader will still be the leader in the future. Now as always you can rely on Baroid to meet your drilling mud needs.

If your executives, engineers and field personnel are not now receiving full data on new Baroid developments, write today for this new information. Keep up with Baroid and you keep ahead in mud technique!

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• Weco Fusible Plugs meet revised A.S.M.E. requirements and are made in strict accordance with the requirements of the Power Boiler Code Committee. They are acceptable to all Boiler Inspection Authorities working under A.S.M.E. codes.

The ¾"x4" Fusible Plug provides additional protection. It will melt out at approximately 450 deg. F. When it melts-out it leaves approximately 9/16" of water over the crown sheet to prevent damage.

All Weco Fusible Plugs are kerosene tested to 1000 lbs. pressure. For protection and safety of your boilers, use Weco Fusible Plugs.

CONVENIENTLY PACKAGED

WECO Fusible Plugs are now packaged in corrugated cartons, clearly labeled to show size, description and quantity.

WECO FUSIBLE PLUGS

SIZE	NO.	WEIGHT
½" x 2⅛"	1093	5 oz.
½" x 2¾"	1087	6 oz.
½" x 3½"	1081	8 oz.
¾" x 2⅛"	1091	8 oz.
¾" x 3"	1085	10 oz.
¾" x 3" Lg. Thd.*	1097	10 oz.
¾" x 4"	1079	12 oz.
¾" x 4" Lg. Thd.*	1095	12 oz.
1" x 2-5/16"	1089	12 oz.
1" x 3"	1083	13 oz.
1" x 4"	1077	16 oz.
*1¼" Thread length		

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

They Say—

They like the News Letter

Dear Sir:

This is to compliment you on the News Letter now being inserted in the front of each publication. It is a worthwhile addition to the Journal, and I surely hope it will be continued.

Earle M. Craig, Jr.,
Willetts & Craig Oil Co.
Midland, Tex.

Dear Sir:

I have just read the Journal News Letter, your new feature. This in my estimation is the most outstanding improvement in the editorial part of the Journal in many years. I like the idea of having the high points in the news itemized in abbreviated form in one section.

. . . Every good wish for the continued success of your wonderful publication . . .

J. M. Linehan, president
Mid-Continent Pipe Line Co.
Tulsa.

Georgia well isn't dry

Dear Sir:

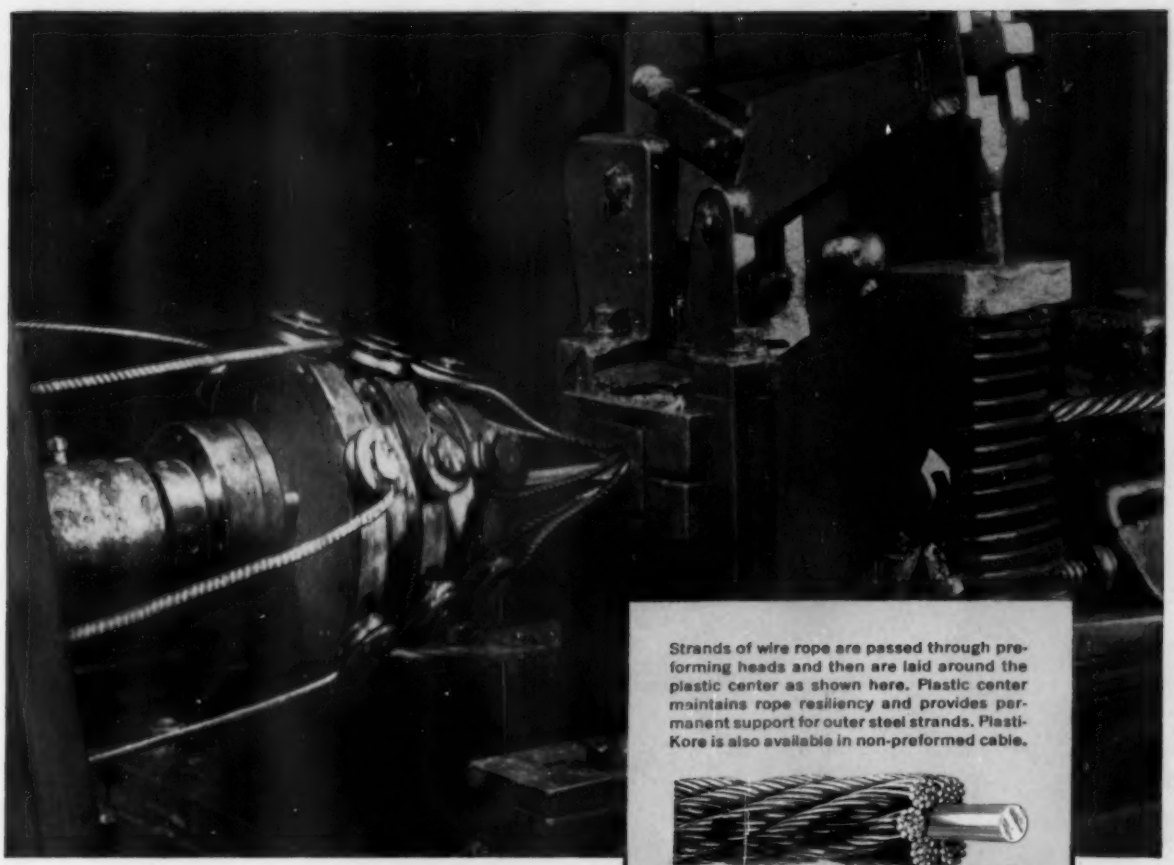
We surely wish to thank you for your article in the issue of April 1, "Can Oil be Found by Direct Methods?"

In making a close examination of the article, we find that everything was okay except in Figure 8 and Figure 9 on page 112. In Figure 8 we showed a test location made on the surface of the ground and where a well was drilled. Figure 9 shows the Schlumberger log of the same well location after the well was drilled.

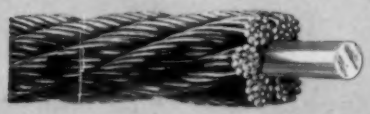
Under Figure 8, you mention that the well was finally abandoned at a total depth of 4,010 ft., and in Figure 9 you mention that the operator failed to establish commercial production.

These titles are a misstatement of facts. The well has not been abandoned. At the moment it is being finished at the portion of the electric log shown in Figure 9. The operators have had some difficulty in procuring casing. This casing is now at the well for finishing this well. A new drilling rig has been moved on this location to set the pipe. Also, the slush pit was covered with oil from the well during the drilling operation.

Putting these remarks on these figures has hurt us very badly. Would you be good enough to run a correction? In Figure 8 eliminate the sen-



Strands of wire rope are passed through preforming heads and then are laid around the plastic center as shown here. Plastic center maintains rope resiliency and provides permanent support for outer steel strands. PlastiKore is also available in non-preformed cable.



why PLASTIKORE wire rope gives you real "snap action"

PlastiKore wire rope has many advantages for use as cable tool drilling lines, sand lines and swabbing lines. The plastic core provides a uniform strength and toughness throughout the length of the line. This results in flexibility with the "snap action" you want.

The plastic center is unaffected by acids, caustics, and water that destroy fiber cores. PlastiKore wire rope gives you long service life despite these rigorous operating conditions.

PlastiKore holds a uniform diameter in the high strain areas of the drum and sheave. Plastic center provides a uniform cushion for the outer strands and maintains strand clearance, thus preventing internal binding. Send coupon today for complete information on PlastiKore.

Jones & Laughlin Steel Corporation
Wire Rope Division
Muncy, Pennsylvania

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Texas Stripper Rod Pump

—the pump that won't sand up. It's especially recommended for shallow, sandy, stripper wells. There are dozens and dozens of these pumps in successful operation throughout the oil patch. Ask your store or the Harbison-Fischer representative in your area to tell you about one running near your lease "Best Pumps in the Oil Patch"®

tence, "The well was finally abandoned at a total depth of 4,010 ft." In Figure 9, eliminate the portion of the sentence stating, "and the operator failed to establish commercial production." . . . To the contrary, the well is now awaiting completion. We expect the well in Figure 8 and 9 to usher in Georgia as a new oil province.

F. W. Lee, president
Lee Geophysical Survey Co.

(Editor's note: Dixie Geological Service shows that the well in question was dry and completed October 10, 1956 at a T.D. of 3,980 ft. The original operator was Lee Oil & Natural Gas Co. Operations were resumed at the well January 7, 1957. Latest scout reports show that the operator is waiting on a larger rig prior to cleaning out to T.D. and running casing. Best wishes to Dr. Lee in his efforts to collect the $250,000 reward offered by the State of Georgia for the first 100-bbl. a day oil well in the state.)

Error in dollars and cents

Dear Sir:

You folks did a nice job of summarizing S. W. Curry's Western Petroleum Refiners Association paper, "The Economics of Producing High Octane Pool Gasoline," in the April 1 issue of the Journal. We are certainly pleased that Mr. Curry's article merited first page mention in your news section.

However, I would like to call your attention to an important omission in the illustration captioned "What Higher Octanes Cost . . . " In lettering the y-axis of this plot, your artist omitted the decimal point for the figures shown —this then means that the incremental cost of processes to reach 101 octane pool, for example, is $60.20 per barrel, instead of 60.2¢ per barrel as correctly stated in the last paragraph of text.

D. P. Thornton, Jr.,
Public Relations Department
Universal Oil Products Co.

(Editor's note: The Journal's editor-artist team flubbed. The "$" on the drawing should have been a "¢.")

Security and crude prices

"It is important to the national security that the economic climate of the oil industry be such as to keep the independent producer in business and to encourage others to enter the business. It has frequently been shown that there is a direct relationship between the price and volume of oil produced on the one hand, and the rate of drilling and capacity to produce, on the other.

"The greater the number of independent companies operating at a profit, the greater the number of wells drilled and the greater the nation's capacity

The CABOT pump is cut out to do but one job—to *pump oil* at low cost with minimum of down-time.

When all points of buying a pump are taken into consideration, the original costs, operational costs, performance abilities and low serviceabilities are the main factors in making a selection.

Before you buy or specify, let your **J & L Supply man** nearest you tell you how CABOT will get more oil in the tank for less money.

OIL FIELD PUMPING EQUIPMENT
CABOT
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ACCURATE,
CONTROLLED,
Timed
LUBRICATION
The New 82-V vacuum pumping unit "with dry sight feed," an exclusive Manzel development will end your liquid sight feed problems. Install them on any existing Manzel lubricator. Now — more accurate than ever . . . it will pay you to get complete detailed information on this dependable, field-proven Manzel unit.
WRITE FOR COMPLETE CATALOG
Manzel
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to produce oil. The greater the nation's capacity to produce oil, the greater its security. To a not insignificant extent, the safety of the nation depends upon whether the price of crude oil is sufficient to encourage independent producers to explore for, discover, and develop its oil resources."

Statement of the Oil Producers Agency of California before a Senate subcommittee.

Depletion a sensible plan

"Percentage depletion is a reasonable and sensible plan to provide for the fact that oilmen, or other people who mine minerals, are selling an irreplaceable capital asset when they sell their products. In this, percentage depletion is identical in concept to the capital gain provision of the income tax law. The Congress has justly provided for nearly 40 years that the income of such persons should be taxed in such a way that this fact is taken into account.

"Percentage depletion applies only to the income from crude-oil production and not to income from refining, transportation, or marketing. It has been a good law and has helped assure this nation of a plentiful supply of oil. The provision has also been applied to coal, uranium, sulfur, salt and a long list of other essential minerals . . . "

Felix Chappellet, vice president and general manager, Western Oil and Gas Association, in a letter to the Ventura County (Calif.) Star-Free Press

Refining's classification

Dear Sir:

We should like to call to your attention certain inaccuracies in the editorial entitled "Refining is an industry —not just another chemical," which appeared in the March 27, 1957, issue of The Oil and Gas Journal, page 95.

While we are not unsympathetic to the position of the petroleum refining industry in the matter of the proposed reclassification, we feel that the record should be set straight so far as background details are concerned.

The chemical industry did not originate and did not sponsor the suggested revision of the Government's Standard Industrial Classification of 1945 to reclassify the petroleum refining and chemical industry major groups. The suggestion was made by the U. S. Bureau of the Budget and sponsored solely by that agency.

Contrary to the statement in your editorial, the Bureau of the Budget suggested that the petroleum refining subgroup of major group 29 entitled "Products of Petroleum and Coal" be combined with a new major group 28 entitled "Basic Chemicals and Petro-

all things considered . . .

Highest Quality Materials
Finest Workmanship
Exact Uniformity
Rust-Proof Coating
Color coding for thread identification
Clear labeling for size, thread and weight
Careful, attractive packaging

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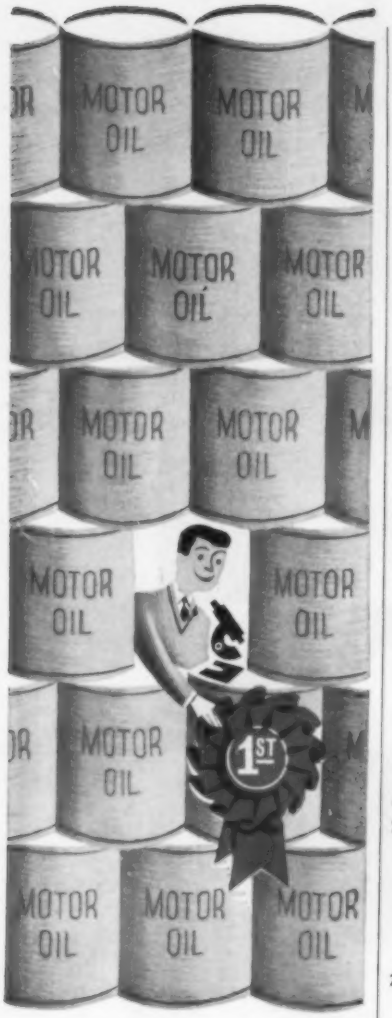
Larkin, Through Your Supply Store, is your finest source for:

- Bull Plugs and Swage Nipples
- Tubing Nipples (Pup Joints)
- Tubing Couplings, substitute
- Tubing Couplings, regular
- Casing Couplings
- Pipe Couplings
- Casing Nipples
- Adapter Nipples — Grooved, threaded or beveled

LARKIN PACKER COMPANY, INC.
WAXAHACHIE, TEXAS



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*the *only* complete line of high-quality additives for fuels and lubricants.

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Pioneer in Petrochemicals

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leum Refining." Your editorial suggests that "Petroleum Refining" was to be omitted from the title of the proposed major group 28. This is not the case.

Perhaps you will wish to correct the foregoing inaccuracies in an early issue of your Journal.

M. F. Crass, Jr.,
Secretary-treasurer
Manufacturing Chemists' Association, Inc.
Washington.

(Editor's note: Adding the words "and Petroleum Refining" to the title of the proposed Basic Chemicals group is a gracious but empty gesture. Statistics on petroleum refining would still be buried as a subgroup of the chemical industry. And it would seem to make little difference who started the idea. The petroleum industry is more interested in future results than in past history.)

CALENDAR OF EVENTS

APRIL

23-25 Petroleum Conference on Oil and Gas Taxation, sponsored by The Oil Institute of McMurry College, Texas Mid-Continent Oil and Gas Association, Texas Independent Producers and Royalty Owners Association, and West Central Texas Oil and Gas Association.

24-26 Natural Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.

24-26 American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.

25-27 Appalachian Geological Society, Kentucky Geological Society, joint field conference, southeastern Kentucky.

25-27 American Association of Petroleum Landmen, third annual convention, Hilton Hotel, San Antonio, Tex.

27 American Institute of Chemical Engineers, Oklahoma state meeting, Bartlesville, Okla.

28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla.

29-May 1 Southern Gas Association, annual convention, New Orleans.

MAY

1-3 American Petroleum Institute, Division of Production, eastern district meeting, William Penn Hotel, Pittsburgh.

6-8 American Petroleum Institute, annual pipeline conference, Cleveland Hotel, Cleveland.

6-8 American Geophysical Union, thirty-

Quitting Time..?

. . . No sir; this ABI man has an important date. A little over an hour ago a drilling superintendent on a Pierce Junction workover called the Brine Service Company in Houston for 400 barrels of super-saturated, Ready-Made brine.

In about 20 minutes this ABI driver will have made his delivery and ABI will add another name to its rapidly growing list of satisfied customers. ABI realizes the importance of keeping appointments on time. When ABI says they'll provide three hour service anywhere along the Texas Gulf Coast, in Louisiana, Eastern New Mexico and West Texas, they mean exactly that. ABI knows time is a valuable commodity in the drilling business.

Call the ABI brine company nearest you and find out for yourself.

Associated Brine Industries

COMPANY	PRODUCING POINTS
Brine Service Div., Corpus Christi Salt Co	Beaumont, Tex.; Pine Prairie, La.
Brine Service Co.	Houston, Corpus Christi
Toland Brine Service, Inc.	Kermit, Tex.
The Brine Co.	Midland, Tex.; Hobbs, N. M.

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AMERICAN IRON & MACHINE WORKS CO. INC.
OKLAHOMA CITY

with MORE SUPPORT than any other valve!

The three-web design permits full fluid flow through the seat, without increasing velocity of the fluid . . . assuring full loading of mud chambers. Webs act as a positive seat for valve, giving full support from below.

When valve is fully seated, the mushroom top of valve seat gives 360° support to the inside top cylindrical section of valve, assuring even distribution of weight and pressure on seat.

Since mushroom on valve seat projects above the top of seat, far more support is given to the stem on the valve. This assures that valve will open and close with a minimum of wobble.

On downward stroke of valve, the compound 808 insert seats first, before tapered metal section of valve contacts seat. After insert has seated and pressure increases, the taper on valve and seat mate, giving 360° metal to metal support.

AVAILABLE THROUGH YOUR LOCAL SUPPLY STORE

Another AMF Product
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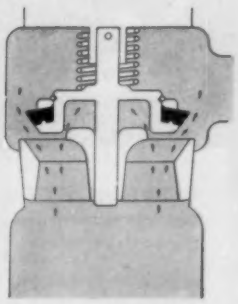
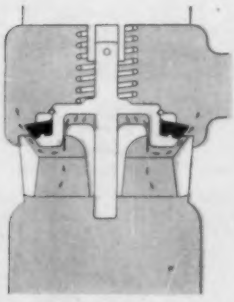
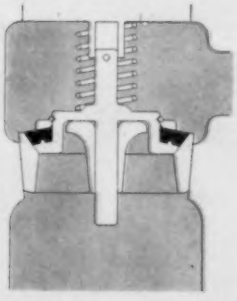


1 Above diagram shows the valve in fully opened position . . . mud has filled the chamber and also the cylindrical area of the valve.



2 As the valve starts to close . . . mud, which is trapped in the cylindrical area of the valve, is squeezed out around the restricted area between the mushroom and the valve.



3 As the valve nears fully-seated position . . . rubber insert contacts seat first and, as mud is entirely squeezed from between the valve and mushroom on the seat, shock is cushioned and the valve fully seats, with no excessive pounding.

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FOREMOST! Since . . .
Spindletop's crude was piped to refineries

In 1902, a 20-mile pipeline began transporting Spindletop's oil to Port Arthur refineries. Today . . . thousands of miles of pipeline carry gas, petroleum, and petrochemical products throughout the United States.

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Today, Williams makes the Broadest Line of its Kind.

NOTE: You get quickest delivery at lowest cost from your local distributor.

Write for Catalog 302 showing the complete Williams line.

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eighth annual meeting, National Academy of Sciences, Washington, D. C.

7 American Gas Association, committee on underground storage, operating section, Mark Hopkins Hotel, San Francisco.

8-10 Canadian Institute of Mining and Metallurgy, eighth annual convention, petroleum and natural-gas division, Macdonald Hotel, Edmonton.

8-10 American Gas Association, Pacific Coast Gas Association, gas supply, transmission, and storage conference, Mark Hopkins Hotel, San Francisco.

9 Panhandle Producers and Royalty Owners Association, annual meeting, Herring Hotel, Amarillo, Tex.

9-10 Fourth annual heat-transfer conference, Oklahoma A. & M. College, Student Union Building, Stillwater, Okla.

9-10 Symposium on use of surface active agents in water flooding, Pennsylvania State University, department of petroleum and natural gas, State College, Pa.

12-15 Liquefied Petroleum Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

13-15 Industrial Waste Conference, sponsored by Purdue University, Purdue Memorial Union Building, Lafayette, Ind.

13-16 American Petroleum Institute, division of refining, midyear meeting, Sheraton Hotel, Philadelphia.

14-16 Industrial Nuclear Technology Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, Museum of Science and Industry, Chicago.

16-17 American Right of Way Association, third annual national seminar, Conrad Hilton Hotel, Chicago.

16-17 American Petroleum Institute, division of production, Pacific Coast district meeting, Hotel Biltmore, Los Angeles.

16-18 Geological Society of America, southeastern section, annual meeting, Morgantown, W. Va.

19-22 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

20-22 American Petroleum Institute, division of transportation, central committee on transportation by water and tanker corrosion symposium, San Francisco.

20-22 American Gas Association, chemical, engineering, and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Fla.

20-23 American Society of Mechanical Engineers, twenty-ninth annual conference and exhibit of the oil and gas power division, Kentucky Hotel, Louisville, Ky.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

23-24 Kentucky Oil and Gas Association, annual membership meeting, Hotel Phoenix, Lexington, Ky.

23-24 American Institute of Mining, Metallurgical, and Petroleum Engineers, third annual joint meeting, Rocky Mountain petroleum sections, Northern Hotel, Billings, Mont.

23-24 Western Petroleum Refiners Association, southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso, Tex.

27-29 Rocky Mountain Oil and Gas Association, twelfth annual convention, Denver.

29-31 Annual short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

A Parkersburg Hyreco's **LIQUID**

KNOCKOUT PUNCH

means more profits in cold separation

Operators like the savings in maintenance costs when they produce through a Hyreco cold separation unit. These savings are possible because Parkersburg's exclusive vertical type liquid knockouts completely remove water and waste from the well stream before it enters the high pressure separator. This adds up to a three-way savings:

1. **LESS LABOR COST.** Convenient clean-out ports make Parkersburg vertical knockouts easier to clean, a real savings in man hours.
2. **LESS LOSS OF WELL PRODUCTION TIME.** Your well produces more hours through a Hyreco because less time is required for cleaning out the unit.
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32-S-2

JUNE

3-5 Petroleum Electric Power Association, annual convention, Amarillo, Tex.

3-7 Oil-Heat Institute of America, thirty-fifth annual convention, Sheraton-Plaza Hotel, Boston.

4-6 Second annual Appalachian Underground Corrosion Short Course, West Virginia University, Morgantown, W. Va.

6 Pennsylvania Grade Crude Oil Association, thirty-fourth annual meeting, Penn-Sheraton Hotel, Pittsburgh.

9-13 American Society of Mechanical Engineers, semiannual meeting, Sheraton-Palace Hotel, San Francisco.

10-12 Interstate Oil Compact Commission, midyear meeting, Yellowstone Natonal Park.

10-14 Gordon Research Conferences, petroleum, Colby Junior College, New London, N. H.

16-21 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

17-21 Gordon Research Conferences, catalysis, Colby Junior College, New London, N. H.

19-21 Association for Computing Machinery, twelfth annual meeting, University of Houston, Houston.

20-21 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Broadview Hotel, Wichita.

20-22 Natonal Oil Scouts and Landmen's Association, annual meeting, Hotel Cosmopolitan, Denver.

23-27 Canadian Gas Association, Jasper Park Lodge, Jasper, Alta.

JULY

8-19 Industrial Statistics for the Process Industries, second annual conference, sponsored by American Society for Quality Control and the University of Oklahoma, Lockett Hotel, Norman, Okla.

AUGUST

26-28 Seventeenth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

28-30 Instrument Society of America, International Symposium on gas chromatography, Kellogg Center, Michigan State University, East Lansing, Mich.

SEPTEMBER

3-5 Pacific Coast Gas Association convention, Fairmont and Mark Hopkins Hotels, San Francisco.

5-7 New Mexico Geological Society, eighth annual field conference, southwestern Colorado.

8-13 American Chemical Society, 132nd national meeting, New York City.

9-10 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

11-13 National Petroleum Association, fifty-fifth annual meeting, Traymore Hotel, Atlantic City, N. J.

19-21 Rocky Mountain Oil Show, fairgrounds, Casper, Wyo.

23-25 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Mayo Hotel, Tulsa.

26-27 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

26-27 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, Roosevelt Hotel, New Orleans.

30-Oct. 2 American Oil Chemists' Society, 1957 fall meeting, Netherland Plaza Hotel, Cincinnati.

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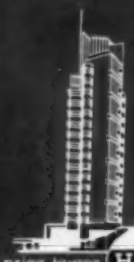

*patents pending

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the OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

The West-Side Sewer

IF YOU are an oil man, of moderate prominence, and if you lead a good, clean life, you may be immortalized by having a cesspool named after you.

A further qualification is that you must be on joke-swapping terms with a rosy-cheeked rascal by the name of Winfield Scott Morris, Jr. This character can be a serious engineer when necessity requires, but his chief preoccupation is getting the most pleasure out of life. That's why he knows everybody in Texas, why nobody ever calls him anything but Buck, and why he gets a chuckle out of being referred to as operator of the world's biggest sewer system.

Buck's sewer is known officially by the accurate but jaw-breaking name of the East Texas Salt Water Disposal Co., and there's absolutely nothing like it anywhere in the world. There are salt-water-disposal operations in many other oil fields—most of them patterned after this one—but this is the only one set up as a profit-making, tax-paying, stock-issuing corporation.

Strung out along the west side of the 40-mile-long East Texas oil field, this company has around 50 "sewer plants" and "cesspools" for getting rid of the water that the field produces along with the oil. And each one of them bears the name of an oil man.

This started because the wife of one of the directors of the E.T.S.W.D.Co. told Buck that when she was a girl a fortuneteller predicted that she would marry a Texan who would achieve a modicum of fame. She said she did marry a Texan but was still waiting for the fame. The gallant Buck promptly rose to the opportunity and fulfilled the prophecy by naming his first cesspool for her husband.

As a result, the west-side sewer is embellished with the names of such illustrious Texans as Bryan Payne, Joe Zeppa, Jack Pew, Bob Hardwicke, John Suman, Jake Hamon, and many more.

All that the E.T.S.W.D.Co. does is to collect waste water from oil wells and pour it down holes in the ground. This would seem like an absurdly simple operation. But the oil industry has to do everything the hard way. That's why this $2,000,000 corporation, with 125 employes, has been experimenting with pouring water down holes for 15 years and still hasn't learned all about it.

As oil is produced from East Texas field, salt water moves in behind it. Most of the wells produce some water, those on the west side have all gone to water, and all the rest will eventually. Farmers, fishermen, and water drinkers have an aversion to having salt water dumped into creeks, and producers were up a stump as to how to get rid of the stuff. So they organized the west-side sewer system and passed the buck to Buck.

The producers were glad to pay just to have the waste water hauled off, but the operation has resulted in more oil for them. The disposal wells, or cesspools, are drilled below the oil-water contact level in the producing reservoir. Since salt water is so much heavier than oil, the weight of the water pouring down the cesspools floats the oil right up to the tops of the producing wells—a neat trick.

And as long as Buck's crew keeps the water clean, it washes the oil out of the sands so thoroughly that East Texas has the highest recovery rate of any field in the world.

But it's keeping the water clean that causes the trouble. The warm brine is a perfect breeding place for bacteria. The instant air hits it, the germs swarm in from nowhere and turn the water black. They act on the various minerals in the water and turn them into solids that would soon plug up the wells. So all the water has to be treated with germ-killing chemicals and precipitating agents and thoroughly filtered and sterilized until it is virtually surgically pure before it is dumped down the cesspools.

That's why all the time that Buck Morris can spare from civic activities and spinning tall tales of the oil patch is devoted to fighting bacteria and keeping things clean in East Texas.

This E.T.S.W.D.Co. is one of those odd-ball operations that illustrate how the oil industry is always learning new ways of doing things, always trying to get more oil out of the ground, and always trying to turn adversity into a blessing.

And that's why some two-score prominent oil men feel honored by Buck's whimsy of giving their names to his cesspools.

—Henry D. Ralph.

Exactly Right!

. . . for many troublesome jobs

Thousands of BAKER CEMENT RETAINERS have been *successfully used* for placing cement, plastic, acid, or other fluids through tubing or drill pipe *at the place* where they will be *most effective*, behind the casing or liner; or *around the shoe*, or *into open hole* below the shoe. To be specific, Baker Cement Retainers are universally used for these important—and often troublesome—applications . . .

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You have to fight to keep freedom of speech

THREE cheers and a hearty slap on the back for H. A. Inness Brown, an oil-paper editor with the courage of his convictions and the guts to talk back to a congressional investigating committee.

Because his paper, The Gasoline Retailer, had the temerity to write editorials opposing some pending legislation, a committee headed by Rep. James Roosevelt subpenaed him and all his records without telling him why or making any charges against him.

A crasser attempt to browbeat political opponents and intimidate them into silence could scarcely be found in America. It came perilously close to abridging the constitutional guarantee of freedom of speech, freedom of the press, and the right of petition.

WHAT THE GASOLINE RETAILER opposed was the Kefauver-Patman bill (S. 11) purporting to aid small business by restricting the freedom of pricing in retailing, and also a series of Roosevelt bills to reform gasoline marketing in various ways.

Advocates of such legislation—chiefly retailer associations—nearly got their bill passed last year without opposition. This year the opposition has been intense. Apparently chagrined at this, the bill's sponsors have attempted to discredit and browbeat the opposition. Investigation of The Gasoline Retailer was part of this smear campaign.

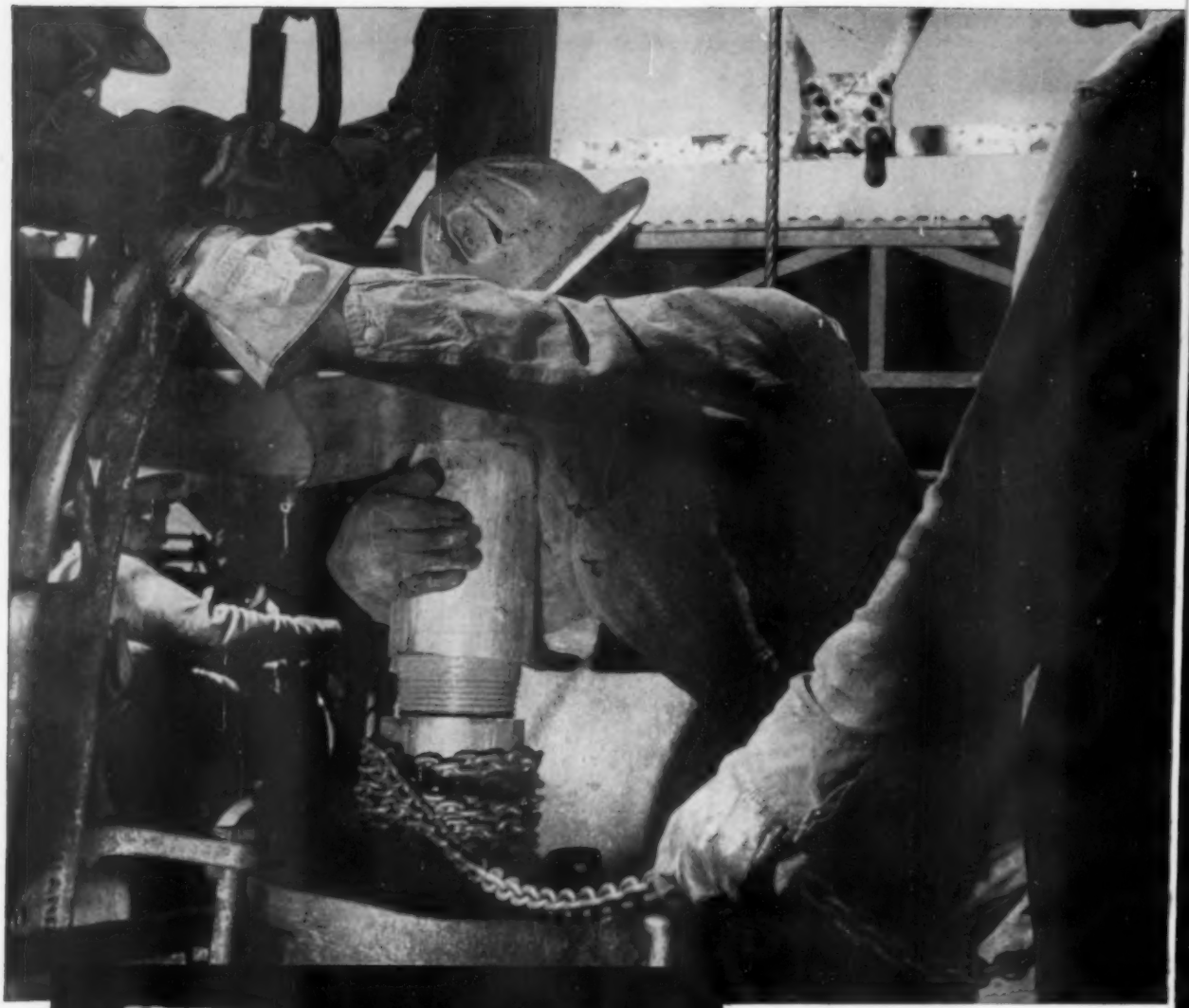
But Inness Brown was not intimidated. On the witness stand he defended his integrity, the independence and fairness of his publication, and his right to express his own opinions. He championed freedom of thought and challenged the committee's power to investigate him. He denounced the proceedings as an attempt to suppress the presentation of all viewpoints on pending legislation.

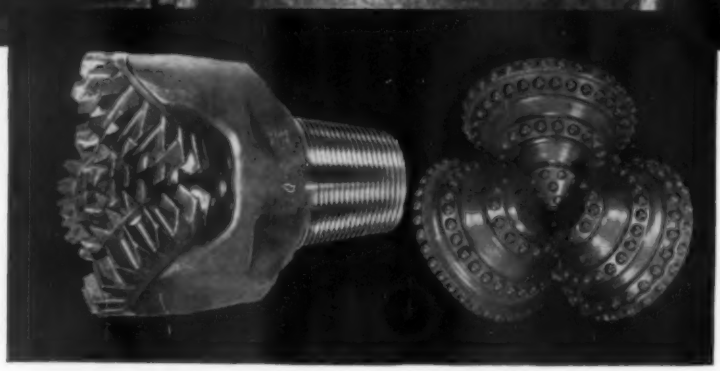
The committee was so taken aback by such conduct that it quickly cleared The Gasoline Retailer of any implications of unfairness or impropriety. It publicly apologized to Inness Brown. Roosevelt then announced that hereafter the committee will do some investigating before making charges or issuing subpenas.

IT'S HIGH TIME that more people refuse to cower before the abuse of legislative privilege and the practice of investigating committees of persecuting witnesses, making baseless accusations, and impugning the motives and methods of persons interested in legislation.

The oil industry has been a frequent subject of this sort of rough treatment. Examples are the charges and innuendoes blasted at those seeking enactment of a natural-gas bill, and the unfounded accusation leveled at the industry during the European oil lift.

The case of The Gasoline Retailer shows that oil can hit back. Inness Brown's example should stiffen spines throughout the industry.





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REPUBLIC ALLOY STEELS resist wear and abrasion, are tough and durable, with exceptionally high strength-to-weight ratios without sacrifice of safety. That is why they are used for gears, shafts, bearings, tools, and equipment like these diamond-sharp drilling bits.

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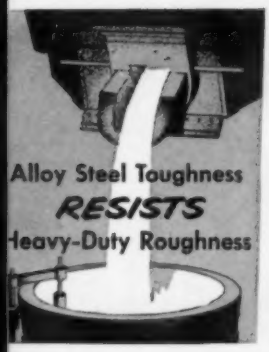

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STEEL

nd Steel Products

Good Wells Make Good News

April 22, 1957

CEALMENT* is a Dowell-developed cementing service that uses a latex-cement slurry. It has provided successful cement jobs under conditions where ordinary cementing often fails. Here are some examples of what this new, exclusive Dowell cementing service has done for others.

- **Alberta, Canada:** An old well in the Joseph Lake Field had declined in production until operator ordered acid treatment. After treatment, well produced 100 per cent water. Cealment was used to perform Bradenhead squeeze, without packer, to shut off water. After multi-stage squeeze, using 40 barrels latex-cement, complete water shut-off was achieved. After drilling out and reperforating, well pumped allowable.

- **Jack County, North Texas** (New Well): Drilled in conglomerate to 5520′. Drill stem tests showed oil at 5450′, water at 5520′. After cementing casing and perforating oil zone, well came in flowing but went to water, revealing channel in cement. Then Dowell was called to squeeze latex-cement through perforations opposite water sand. Result, after reperforating and Mud Acid cleaning, was a 125 BOPD flowing well.

- **Andrews County, West Texas:** An operator in the McFarland Queens field had wells go to water after fracturing. Defective cement jobs were suspected. So, on one well, he used Cealment, tailing in with 500 gallons of latex-cement while setting the 5½″ oil string. This procedure was so successful in solving the water problem that the operator standardized on Cealment to tail in all his oil strings in this field.

- **Calcasieu Parish, Louisiana:** An old well sanded up, indicating the possibility of a hole in the casing. Squeeze testing revealed holes at 4610 and 4624 feet. Cealment was used to patch both holes at the same time. 800 gallons of latex-cement were placed using a squeeze tool above the upper hole. After drilling out, casing was tested to 1200 psi and no leaks were found.

Though the cases presented here deal primarily with remedial work, operators are also finding Cealment has many advantages over common portland for tailing in long strings and setting liners.

For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oil Well Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

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Services for the oil industry

DOWELL

A Service Subsidiary of The Dow Chemical Company

the OIL AND GAS JOURNAL

APRIL 22, 1957

Eisenhower Endorses Gas Bill

● But it's still a long way from enactment. White House support was essential, but some feel still more help is needed. Opponents are gathering forces, but reaction is still only lukewarm

WASHINGTON.—The Harris-O'Hara gas bill got some much-needed support from the White House last week.

President Eisenhower gave the bill the endorsement which Rep. Oren Harris of Arkansas predicted would be forthcoming when he put the bill into the House hopper *(The Oil and Gas Journal, April 15, page 81)*.

Eisenhower said he had only heard about the bill. He had not seen it but some of his assistants and associates had, he told a news conference.

"I do believe we have to have a natural-gas bill to bring about a fair and equitable arrangement in this field," the President said.

The Harris-O'Hara bill agrees in general with the conditions he laid down when he vetoed the Harris-Fulbright bill last year, he said.

The major aims of a gas bill, the President said, must be to insure consumers a fair price and adequate supply.

Eisenhower disclosed that he has a personal interest in the problem. He uses gas on his Gettysburg farm. He pays $3.31 per thousand cubic feet and has been notified the price will jump 50 cents a thousand next month. And he doesn't like it.

More help needed . . . The President's backing improved chances of action by Congress. House Speaker Sam Rayburn of Texas said his statement would be enough to get the bill considered this year. "If he will remain that way and talk to some people and get some votes for it," Rayburn added.

Rayburn indicated, however, that the bill will not be pressed for action this session "unless we can get some votes we didn't get before and it's up to the President to get them."

Administration support had less immediate effect in the Senate. Sen. J. W. Fulbright of Arkansas who led the drive for the vetoed bill last year will not sponsor it again, he said. But if it comes up for passage he will vote for it, he added.

Fulbright is still sore about the President's veto action. He took it "without any good reason," he charged.

Opposition organizing . . . As the President spoke out for the bill, its foes were becoming more vocal also.

The opposition is coming from the same consumer areas which vigorously opposed previous attempts to relieve natural-gas producers from federal regulation.

Advocates of the bill so far have withheld their fire in the preliminary skirmishing. They're apparently waiting until the measure starts its legislative course through committee.

The bill, however, has met a mixed reaction within the oil industry, just as Rep. Oren Harris of Arkansas predicted *(The Oil and Gas Journal, April 15, page 81)*. Here's how the industry generally feels about the bill:

. . . Gas producers are not too happy. They hoped any new bill would take them entirely from under the thumb of the Federal Power Commission. They object to the provision requiring them—or their pipeline customer—to defend their contract price before the FPC.

. . . Distributing companies are suspicious of the commodity pricing system laid out in the bill, but most of them are expected to go along.

. . . Pipeline companies apparently are the only segment of the industry content with the measure as now written.

Familiar foe . . . First congressional reaction came from Sen. Alexander Wiley of Wisconsin, who opposed the 1955 bill.

Wiley declared the bill will make a "hollow shell" of federal regulation of natural-gas prices.

There is nothing to show that the oil and gas industry has suffered under federal regulation, Wiley told the Senate. But there is every evidence to indicate that the industry has prospered and will continue to do so if reasonable regulation is carried on.

The bill sets up a pricing standard which the FPC would find impossible to follow, Wiley charged. It would be "following the market price rather than leading, abjectly approving rather than independently establishing a fair regulated price," he said.

Wiley claimed that the industry's objective is to deny consumers the protection which they should expect under the Natural Gas Act.

"The oil and gas industry is definitely entitled to a reasonable return on their investment," he said. "The local gas distributors are entitled to a reasonable return. The pipelines are entitled to a reasonable return on their investment. But so, too, the public is entitled to reasonable protection."

Wiley served notice that he will fight the bill in committee and on the floor. Sen Joseph S. Clark of Pennsylvania, former mayor of Philadelphia, immediately offered his support.

Gray Studying Imports

New ODM director is making complete new study to form his own opinion. One thing is certain: No more hearings

WASHINGTON.—A new approach to the problem of oil imports appeared last week to be in the works at the Office of Defense Mobilization.

The entire situation is being examined so that Mobilizer Gordon Gray can form an independent judgment, a high ODM official disclosed.

Gray, himself, said he has the statutory responsibility to exercise his own best judgment as to what should be done about oil imports. The decisions made by his predecessor, Arthur S. Flemming, will not be disregarded, it was indicated. But they may be modified.

Flemming last fall said that but for the closing of the Suez Canal he would have been forced to send the import problem to the White House for action under Section 7 (the national-security provision) of the Trade Agreements Act.

Gray has laid the matter before the cabinet fuels committee. But its decisions may be considered advisory, rather than binding on the ODM.

It was disclosed at the ODM last week that residual imports are again a matter of concern to coal producers. A request for action to limit them has been filed.

Schedules too high . . . Gray does not believe that his only responsibility is to pick up the import problem where Flemming dropped it, an ODM official explained. That would mean to consider the Suez crisis a closed episode and weigh the importers' latest schedules against the 1954 relationship recommended by the cabinet committee.

The schedules for the coming 6 months filed by the importing companies late last month are above the formula, it was admitted. Just how far the excess goes has not been disclosed.

Gray has had a number of meetings with congressmen and outside interests, both supporters and opponents of import control. These talks are still going on.

There are several courses which Gray can follow, an ODM source said. These range from doing nothing "and hoping the problem will go away," which is impossible, to immediately passing the buck to the White House, which Gray will not do.

In between those extremes, he can adopt a wait-and-see attitude. Or he can make another effort to induce the importing companies to shave their schedules to acceptable size.

Gray has not disclosed what course he will follow. He is studying all angles. Among them he is analyzing the conditions that prevailed in 1954 and led to the adoption of the import formula. He wants to decide whether the present situation calls for the same treatment.

While Gray will study the whole matter carefully, there will be no new hearings. He doesn't believe they could add anything to what was developed in the hearings last September.

Gray has made only one thing certain. Whatever decision is reached on oil imports it will be the decision of Gordon Gray. It may or may not agree with the views of Arthur Flemming, the cabinet committee, or members of Congress interested in imports.

Flemming's newest warning:

Cut Imports or Be Controlled

CLEVELAND.—The time is nearing when the oil industry once again must face up to the problem of oil imports.

But one prominent citizen — former ODM director Arthur W. Flemming—thinks the importers will show the "required statesmanship and leadership" and keep them below the level that would threaten national security.

If they don't, he warned, the Government will have no alternative to fixing controls. Controls breed more controls, and the end result could only be complete regimentation of the oil industry.

Flemming, now president of Ohio Wesleyan University, made the remarks last week at the fifty-fourth semiannual meeting of the National Petroleum Association.

Sincere convictions exist on the part of many companies that they cannot comply in full with import restrictions, Flemming said. These companies, he added, must subordinate their short-range disadvantages to the long-range advantage of a strong domestic industry.

Long-time importers, he said, must not only hold their ratio of 1954, but they must also move over to make room for new importers.

The only solution, he emphasized, is voluntary compliance without government interference.

Flemming said he believes cooperation from the industry will be forthcoming. His conviction arises from the high respect he holds for the industry, because of its past effort at solving honest differences of opinion with the nation's position of strength as the foremost objective, he said.

Pipelines Probed

Subcommittee may level new charge of monopoly

WASHINGTON.—A pipeline monopoly charge may be leveled against the oil industry next month by the joint subcommittee which has been investigating the European oil lift.

There are indications that a committee report will allege monopoly in pipeline transportation. The subcommittee is headed by Sen. Joseph C. O'Mahoney of Wyoming.

The investigation stems from testimony by Lowell M. Glasco, vice president of the West Coast Pipeline Co. At recent hearings, Glasco told the subcommittee how he tried to promote a line from West Texas to California.

Glasco said his efforts were thwarted by major companies which did not want independent transportation into the area.

Who's involved . . . The Justice Department has been asked for its view on the matter. The department has an antitrust suit pending against West Coast major companies. In a letter to Victor R. Hansen, head of the antitrust division, O'Mahoney asked whether a West Texas-California line would help break the alleged monopoly.

Mobilization Director Gordon Gray has also been asked whether the ODM has given any thought to the line since the House armed services subcommittee hearings in March 1956.

At that time, former director Flemming and Defense Department officials said there was no need for the line.

West Coast oil companies still feel there is no present or prospective use for such a crude line. This is indi-

cated in letters to the subcommittee, pointing out that other developments—such as oil imports from Canada and the availability of natural gas—now insure an adequate fuel supply for the area.

Slaughter Flood Set

Pan American plans pilot in giant West Texas field

AUSTIN. — Pan American Petroleum Corp. last week filed with the Texas Railroad Commission plans for the first water flood in huge Slaughter field in West Texas.

The project will be a pilot test, which may later be expanded on the company's 4,283-acre Mallet Land & Cattle Co. "G" lease in the western part of the field in Cochran County.

The first well on this lease was completed in 1942, and Pan American says production is in an advanced stage of depletion. There are 119 wells on the lease, making an average 10 bbl. each per producing day. Output since discovery totals nearly 10,000,000 bbl.

Pan American initially will inject about 150 bbl. of water daily by gravity through one input well into the 5,000-ft. San Andres pay zone. Pay thickness averages about 30 ft.

The company didn't estimate how much it expects to increase recovery through water injection.

Production from this lease and the whole of the 85,000-acre West Texas giant is via solution-gas drive. Bottomhole pressure in the area has dropped from the initial 1,690 psi. to around 300 psi. The bulk of the field is in Hockley and Cochran counties with the southern end sticking down into Terry County. Pressure in the western portion in Cochran County generally is much lower than in the eastern Hockley County area.

FPC Sets Conversion Hearing

WASHINGTON. — Final decision on conversion of Texas Eastern Transmission Corp.'s "Little Big Inch" pipeline from gas to products service may be made soon by the Federal Power Commission.

The FPC is scheduling argument on the matter for May 6. To do so, it is bypassing the tentative decision usually submitted by the hearing examiner.

Texas Eastern's application to take the line out of gas service has been before the FPC several years. It was approved in June 1955, but the decision was reversed by the District of Columbia Federal Court of Appeals.

watching WASHINGTON

. . . with Bertram F. Linz

Regulators tapped for probe . . .

ANOTHER congressional investigation of oil and gas is in the making. It will be part of a study by the House commerce committee of the administration of oil and gas laws by the federal regulatory bodies. The Federal Power, Interstate Commerce, Federal Communications, Federal Trade, and Securities and Exchange commissions will be among those covered.

The House has given the committee $250,000 for the job. It did so with some misgivings, however, as evidenced by 143 "nay" votes. But objections were based on economy grounds rather than any opposition to the probe itself. The House already has spent $2,500,000 on probes in the 3 months it has been in session.

The inquiry is designed to bring out whether any of the agencies have shown disregard for the intent of Congress and have issued rulings that had the effect of amending or repealing law. That is a charge that has been made frequently.

House supports land-grab bill . . .

A MOVE to prevent the Navy from blocking private development on government oil lands has passed its first major test.

It is a bill requiring the Defense Department to get congressional approval for withdrawals of more than 5,000 acres for military purposes. It has passed the House and now goes to the Senate. It was introduced by Rep. Clair Engle of California. The bill is a result of the Navy's effort last year to test San Nicolas Island as a possible new oil reserve.

Engle's probe of military land holdings last year brought out that the Navy is sitting on some 800,000 acres of potential oil lands in the Gulf of Mexico. If released, those lands could bring $250,000,000 in bonuses on leases, he told the House.

The Navy contends it has authority to drill for oil on any area set aside for naval purposes. Engle contends that land must be set aside as a naval oil reserve by the President first. The bill spells out the difference between "naval reserve" and "naval petroleum reserve." It holds that the Navy has no oil rights in the former.

Divorcement bill fading . . .

REP. JAMES ROOSEVELT'S bill to divorce refining and marketing is dying on the vine. There is no support for it either in the industry or the Government, the California congressman found.

The objections raised at recent hearings here appear to have convinced Roosevelt the idea is unsound. It was summed up by Victor R. Hansen, Justice Department antitrust chief, as a body blow to competitive free enterprise.

Divorce would ruin independent refiners who are trying to do in a small way what the major companies do on a large scale, Hansen fears.

"One of the remaining strongholds of complete independence in the refining level of this industry lies in the few small enterprises which survive through an integrated production and retail operation," he told Roosevelt.

Hansen, in fact, likes only one of five bills offered by Roosevelt to protect service-station operators. It would permit a plaintiff to recover his costs when he gets an injunction against marketing practices of major companies. Such recovery already is provided for in the case of damage suits.

A second bill is like a law already on the books. Another would hamper the administration's antitrust program. The other two would give petroleum retailers special rights not accorded other small-business men.

PIER LACED with crude and product lines provides only pipelines into . . .

Amoco's New Refinery

● This Virginia plant combines the latest in processing know-how with historic setting to make it a prospective industry show place

YORKTOWN, Va. — American Oil Co. this week is dedicating a new $35-million refinery here that may become a "showpiece" for the industry. It boasts an array of unusual features and plant-layout arrangements.

Amoco officials took advantage of the most modern processing and landscaping know-how in laying out the refinery and grounds. The 1,300-acre site lies in a wooded, isolated area near the juncture of the York River and Chesapeake Bay.

This is historic ground. It's near the site of Cornwallis' surrender closing the Revolutionary War. The first English settlement in America 350 years ago is at nearby Jamestown, and also close by is the restored, colonial village of Williamsburg.

The refinery gives a pleasing general appearance. Its administration, laboratory and other buildings are low and the plant site is being landscaped to conform with its surroundings.

Strange feature . . . The new refinery has one rather uncommon feature: It has no pipeline connection—either for crude or products.

But the location's natural advantages offset this. They include:

. . . A deep-water terminal for incoming crude and outgoing products.

. . . Nearby rail lines and a highway network for product distribution by tank car and tank truck.

Another unusual aspect of the plant will be its staff. Nearly 80 per cent of the 350 workmen are new to the oil industry. But they are well-screened graduates of Amoco's intensive training course.

Mark Hopkins, formerly Amoco's technical director of research and development, is manager of the new plant (see biographical sketch on page 198).

The plant . . . Space is available for substantially increasing size of the plant. And plans already are being made to do just that.

Initial capacity will be 35,000 bbl. daily of 26.6°-gravity Tia Juana (Venezuela) medium crude. First expansion will be addition of a 50-ton per day sulfur-recovery plant. Completion is scheduled later this week. It will be followed by a 25,000-bbl. asphalt plant.

Products of the refinery are premium and regular gasoline, kerosine, fuel oil (No. 2 and Bunker C), L.P.G., and coke. Fuel gas also could be considered a product since it is metered to the adjoining power plant of the Virginia Electric Power Co.

The Yorktown refinery was specially designed to continue Amoco's long-time policy of marketing an unleaded premium gasoline. The company has chosen to gain high octanes through blending high-quality components.

The units selected to produce this gasoline and other products include a combination unit, an Ultraforming and hydrodesulfurization unit, and a delayed coker.

M. W. Kellogg Co. designed and constructed the combination unit. Its components are atmospheric and vacuum distillation, an Orthoflow fluid catalytic cracking unit with gas-recovery section, U.O.P. phosphoric-acid polymerization unit, and gasoline and kerosine-treating sections. Ralph M. Parsons Co. designed and constructed the Ultraformer and hydrodesulfurization unit. Lummus Co. designed the delayed-coking unit with its gas-recovery system.

The fluid catalytic cracking unit will charge 21,408 bbl. daily. It will operate at 61.2 per cent conversion with a synthetic microspheroid catalyst. The poly unit will charge 5,600 bbl. daily from the F.C.C. gas-recovery system and 823 bbl. daily from the coker debutanizer. It will convert 93 per cent of the propylene-butylene mixed feed into polymer gasoline.

The four-drum, continuous coking unit can handle the heaviest feed ever charged to a delayed coker. This is a vacuum-reduced crude with a Conradson carbon of 25 per cent, an A.P.I. gravity of 6.1° and a viscosity, S.U.s., at 210° F. of 6,000. It also must handle lighter stocks at a maximum capacity of 9,600 bbl. daily. Output will be 600 tons per day.

The layout . . . The combination unit follows "in-line" principles.

Towers, reactors, drums, and heat exchangers are arranged in parallel rows. This results in shorter piping runs and low pumping costs. The arrangement also allows for use of mechanized equipment for servicing and maintenance. Most of the equipment is located at grade so inspection and repair can be carried on without scaffolding.

Intermediate product streams normally flow through lines connecting various units without going to storage. This eliminates need for cooling the streams before leaving their respective units. This step conserves process heat. However, intermediate tankage is available for these streams if needed. This will permit independent

operation of most process units for limited periods, such as:

. . . Annual shutdowns. Operator then can take advantage of seasonal fluctuations in demand.

. . . Disturbance of operations. This may arise from a shutdown in an individual unit or from interruptions to tie in new processes.

Plant movement . . . Crude oil from incoming tankers is pumped to the refinery through a single 2.5-mile, 24-in. line. It carries crude to the far end of the refinery. Six product lines then take various products from the near side.

A battery of pumps can load products into tankers at the rate of 240,000 bbl. daily. Loading operations usually require less than 12 hours, allowing quick tanker turnarounds.

The pump building has remote stop-start buttons for switching pumps. It also has recording flow controllers and houses an indicator panel for the remote tank-gaging system. This keeps the operator informed of the liquid level in any feed or product tankage.

The marine terminal is a 3,000-ft. wood and steel dock extending into the York River with a steel and concrete loading platform. The two berths can accommodate simultaneously one supertanker and a T-2 tanker. The dock also provides berths for barges up to 250 ft. in length.

Tankage capacity is 3,770,000 bbl.

Power source . . . Electricity is used primarily for power.

It is purchased from the adjacent Virginia Electric Power plant. This facility also provides an outlet for the refinery's coke and fuel gas. The power plant is tied into the entire VEPCO system, thus providing an unusual degree of insurance against a power failure.

Louisiana to Cut Allowable

BATON ROUGE.—A cut of about 40,000 bbl. per day in Louisiana's oil-production allowable for May has been forecast by Conservation Commissioner John B. Hussey.

Hussey hinted that further cutbacks may follow because of reduced demand for Louisiana crude in Europe. He said a 40,000-bbl. reduction would allow some reserve production for emergency.

The allowable for May will be set April 23.

Louisiana's allowable reached an all-time high of 990,642 bbl. daily in March during the peak of the oil lift to Europe. The April allowable is 919,405 bbl. daily, or 71,237 bbl. below the peak.

Natural Plans 337-Mile Loop

WASHINGTON.—A plan to boost capacity of Natural Gas Pipeline Co. of America by 185,000,000 cu. ft. daily has been laid before the Federal Power Commission.

The project is in addition to an application now pending which would add 485,000,000 cu. ft. daily. Together, the project would increase Natural's capacity to 1,180,000,000 cu. ft. a day. They would bring capacity of Natural's parent firm, Peoples Gas Light & Coke Co., to 1,670,000,000 cu. ft. daily.

The new project, to cost $62,668,000, would be completed before the 1959-60 heating season, 1 year later than the target for the first phase of the expansion.

Natural plans to lay 337 miles of 30-in. loop line between Fritch, in the Texas Panhandle, and Beatrice, Neb., and 59 miles of 36-in. between Beatrice and Joliet, Ill. The proposed projects will add a third parallel line to the dual 24 and 26-in. system from Fritch to Chicago. Compressor units totaling 29,750 hp. will be installed in stations along the line.

Up to 100,000,000 cu. ft. daily will be delivered to Natural at Fritch through a pipeline from North Texas approved by the FPC last December *(The Oil and Gas Journal, December 10, 1956, page 90)*. The remainder will come from other sources in the Texas Panhandle and in Oklahoma.

Texas project . . . Lone Star Gas Co. will supply gas for the 350-mile 20 and 26-in. line from Jack and Wise counties, North Texas, to Fritch.

This line is to be completed by December 1.

R. H. Fulton & Co. is building the Red River crossing on the Oklahoma-Texas border. Fulton & Brodie, Inc., has received the contract to lay the gathering system. Suspension bridges will be built by Pittsburgh-Des Moines Steel Co., Dallas, and soil erosion dams by Ronald L. Scherer, Weatherford, Tex. Main-line construction has not been contracted.

Vermont's First: Here's the cable-tool rig making history in Vermont. It's drilling the 1 Isadore Yandow, which spudded in early in April for Maquam Gas & Oil Development Co. near St. Albans in the extreme northwest part of the state *(The Oil and Gas Journal, April 15, page 97)*. Oil and gas seepages in the area and gas strikes a few miles to the north in Canada were the sparks which finally touched off the drilling program. Three other tests are planned by Maquam. The rig is owned by John Shaw of Kane, Pa.

New outlet for big reserves:

T.G.T. to Tap Offshore Gas

HOUSTON.—Detailed plans for the world's longest offshore pipeline were disclosed last week by Tennessee Gas Transmission Co.

The proposed line, now awaiting a green light from the Federal Power Commission, would tap some of the richest natural-gas reserves yet discovered in the Gulf of Mexico.

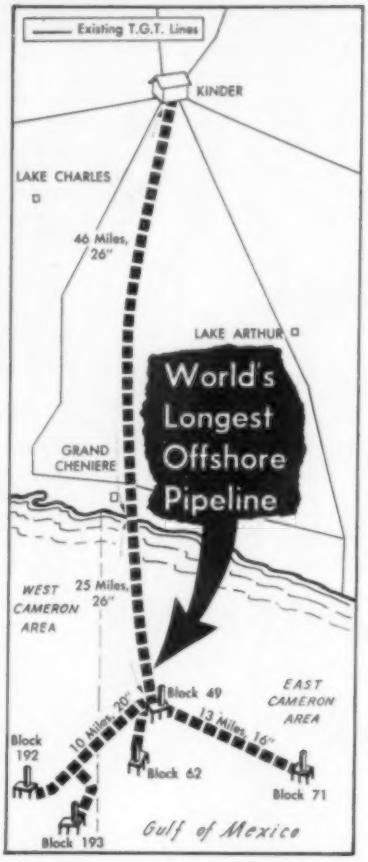
Extending under the gulf for 55½ miles, the line will range from 12 to 26-in. in diameter. An additional 46 miles of 26-in. line will connect the offshore system with T.G.T.'s existing network at Kinder, La. From there, gas from offshore fields will move northeastward to Pennsylvania, New York, New Jersey, and other eastern states.

Underwater portion of the line will be longer than the 48-mile crude line operated by Magnolia Petroleum Co. This carrier, in the Eugene Island area off Louisiana, is now the longest offshore pipeline.

T.G.T.'s proposed system will move gas from several fields in the East and West Cameron areas off Louisiana. The company has contracted for purchase of from 2 trillion to more than 6 trillion cubic feet of offshore gas from the C.A.T.C. Group *(The Oil and Gas Journal, September 24, 1956, page 84)*. The sale has been cleared by an FPC examiner *(The Oil and Gas Journal, April 8, page 72)*.

Plans for the underwater line show that it will extend from shore near Grand Cheniere, La., about 25 miles southeast to a proposed valve junction platform in Block 49, East Cameron area. This portion of the line will be of 26-in. diameter.

The system will fork at Block 49. A 16-in. line will extend 13 miles southeastward to Block 71. A 20-in. line will extend southwest about 10 miles to a proposed valve junction platform in Block 192. Smaller lines will branch out from these junctions to existing platforms nearby.



The agreement . . . Besides picking up gas from C.A.T.C., the line might be a starting place for later extensions to other offshore fields. T.G.T. already buys gas piped to shore by Marine Gathering Co. from fields in the Vermilion area just east of the proposed line.

Terms of the agreement with the four-company C.A.T.C. Group set the initial price for the new gas supply at 21.4 cents per M.c.f.

Escalation clauses provide for an increase of 2 cents per M.c.f. every 4 years starting in November 1962 until the contract expires or the price reaches 35.4 cents per M.c.f. The C.A.T.C. Group is composed of Continental Oil Co., Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co.

Cartel Suit Set for Trial

WASHINGTON.—The Department of Justice is planning to bring its long-awaited "cartel" suit to trial in New York this fall.

The case, filed in 1952, charges that U. S. oil companies operating abroad were parties to a world-wide cartel. Purpose of the cartel, the Government alleges, was to control foreign production, allocate markets, and fix prices.

The suit is based in part on charges leveled against the companies in a Federal Trade Commission report issued in January 1952.

The department has studied more than 100,000 documents to get material for its case, Victor R. Hansen, chief of the antitrust division, disclosed. Most of the documents were secured from the defendants.

"We are now in the final stages of the Government's pretrial discovery," Hansen said. "Our goal is to be prepared for trial by fall of this year."

Gas Imports Hit

Senator claims Canadian gas is bad security risk

WASHINGTON. — Importation of natural gas from Canada will endanger the military and economic security of the United States, Rep. John P. Saylor of Pennsylvania warned Congress last week.

Saylor asserted that midwestern congressmen have been misled about the advantages of a proposed Canada-U. S. pipeline. The promoters of the project have not told "the full story," he charged.

If the Midwest states are tied to foreign gas, a vital part of our defense effort will be dependent on a foreign power, Saylor asserted. In the event of another war, Canadian industries will require a step up in power supply, and it may be necessary to cut off exports of gas. That decision would leave U. S. consumers of Canadian gas without any fuel whatsoever, he said.

Saylor also raised the question of price control on imported gas. The Canadian Government, the pipeline company, and the gas producers would have a hand in setting rates for American consumers, he said. He said there also is the possibility that the Canadian Government might seek to raise revenues by taxing the gas exported.

"Does anyone think for 1 minute that the Canadian Government would overlook the lucrative possibilities of a heavy tax on exported natural gas if the occasion required?" he asked.

"Midwest consumers who have been approached by the international gas speculators should think seriously before agreeing to switch to this foreign fuel, for once the change is made these consumers will be at the complete mercy of alien forces," Saylor said.

Gas Line Lets Contract

CALGARY.—Contract for the first-year construction program of Alberta Gas Trunk Line, to cost $10,963,000, has been awarded Fulton Banister, Ltd., of Edmonton.

This year's program includes 17 miles of 34-in. and 100 miles of 18-in. line. Both lines will start at the western terminus of Trans-Canada

Pipe Line Co.'s system. This is near the Saskatchewan border in the vicinity of Burstall, Sask.

The 34-in. will extend west from the terminus to a point near Cavendish. The 18-in. will extend north to connect Provost and Bindloss fields. Work is to be started by May 15 and end about September 1.

The river-crossing contracts were awarded previously.

The 1958 construction program calls for 64 miles of 34-in. pipe from a point 15 miles south of Bindloss to Denhart and 149 miles of 24-in. from Denhart to Pincher Creek. Denhart and Pincher Creek lie southwest of Bindloss. The over-all program is to be developed in four yearly stages, with completion set for 1960.

Crude Line Starts

Griffith-Cygnet line to move 100,000 bbl. daily

GRIFFITH, Ind.—Work will begin this week on a new pipeline which will supply 100,000 bbl. daily of crude to expanding refinery markets in Ohio, Michigan, and New York.

Tecumseh Pipe Line Co., organized by Sinclair Pipe Line Co., Ashland Oil & Refining Co., and Pure Oil Co., is building the 201-mile, 20-in. line from Griffith to Cygnet, Ohio.

Sinclair, which will operate the line, has let contracts to O. R. Burden Construction Corp., Tulsa, for all but 16 miles on the western end.

Tecumseh will take crude from trunk lines terminating in the Chicago area and transport it to Cygnet, where it will tie in with Buckeye Pipe Line.

Sinclair and Pure plan to move additional crude into the Chicago area through their system from Cushing, Okla. They plan to install four boosters with 10,000 hp. capacity between Salisbury, Mo., and Chicago. This would increase throughput to Chicago by 90,000 bbl. daily.

Buckeye is now converting an old 8-in. line out of the Chicago area to products service. But Tecumseh's project will more than offset this lost crude-oil capacity.

Ultimate capacity of the Tecumseh line, with two pumping stations, will be 170,000 bbl. per day. However, a single station will power the line at first. It will be built at Hartsdale, Ind., near Griffith.

Burden will lay 185 miles of the pipeline. Two spreads are moving in, one to handle 93 miles and the other 92 miles. Pipe should be laid in about 90 days, and the line is expected to be pumping crude in September.

Congress Eyes Aramco's Taxes

● The question: Are the payments royalty or taxes? If royalty, U. S. lost $80,000,000 last year, tax men say

WASHINGTON.—The Senate probe of the European oil lift is centered now on a study of Arabian American Oil Co.'s payments to Saudi Arabia.

Congressional tax experts are digging into the question of whether these payments are taxes, as claimed by Aramco, or simply royalties, as charged by Sen. Joseph C. O'Mahoney of Wyoming.

Now considered taxes by the Internal Revenue Service, the payments are credited against taxes which otherwise would be due the U. S. Treasury. As royalties, they would be deductible from income, which would increase Aramco's tax bill here.

O'Mahoney, backed by Senators Estes Kefauver of Tennessee, John A. Carroll of Colorado, and Paul H. Douglas of Illinois, asked Chairman Harry Byrd of the finance committee to study whether the Saudi Arabian income tax is designed to help Aramco avoid U. S. taxes.

Background . . . The Saudi Arabian arrangement came up during the questioning of Aramco officials last month on their role in the plan to supply Europe with oil after the closing of the Suez Canal.

Aramco officials said the company paid $48,000,000 in U. S. taxes in 1948 but only about $250,000 last year. This was the result of a Saudi Arabian income tax designed to provide an equal division of income between the government and the company.

Saudi Arabia last year got $80,000,000 in royalty and about $200,000,000 in taxes. Had the latter been classified as royalties, the U. S. Treasury would have secured about $80,000,000, tax experts figure.

The company takes both the foreign tax credit and the depletion allowance. The latter last year amounted to some $152,000,000.

The company last year had net earnings of $281,000,000. These were split between the four companies which own Aramco, and by the time the money reached the shareholders the Treasury collected about $100,000,000, Chairman F. A. Davies said.

Both the tax credit and depletion are under attack. They are costing the Treasury "hundreds of millions of dollars," Carroll charged.

O'Mahoney made it clear, however, that the attack on depletion does not extend to domestic producers. In an apparent bid for support from domestic producers who have been fighting heavy imports, he said they need the allowance as a means of paying for the search for new reserves.

"There is complete justification for granting depletion to domestic companies because of their higher costs," O'Mahoney declared.

"But depletion allowances on foreign produced oil is just a stimulus for the importation into the United States of cheap foreign crude."

Coal Helps Fuel Diesel Engine in Tests

DENVER.—Denver & Rio Grande Western Railroad has found a way to burn coal in a diesel locomotive.

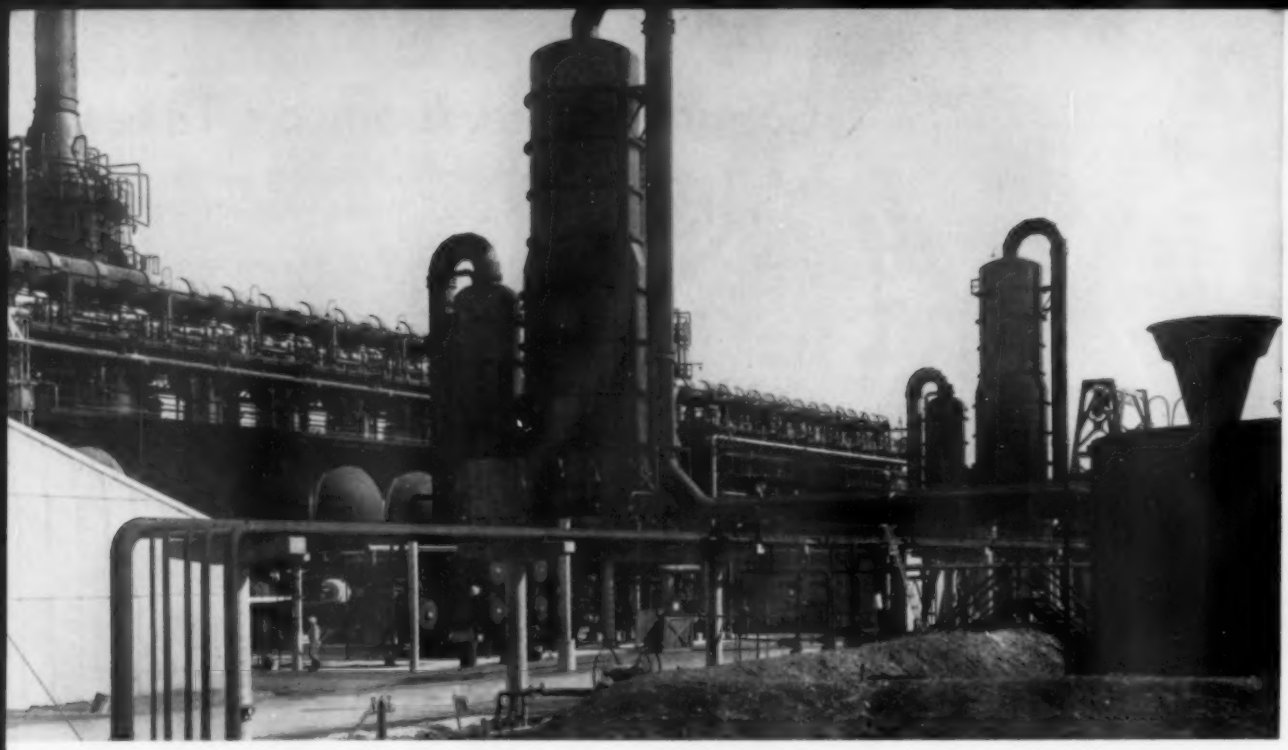
What's more, its research could point the way toward use of distillate oils which cost less than high-quality diesel fuel.

The company has used atomic-radiated coal mixed with oil as a fuel for diesel engines. The same process is being tried with gilsonite and other mineralized waxes found in the West.

Ray McBrian, engineer in charge of the research, says the coal is crushed to mesh and treated with waste products from atomic reactors. The radiation process splits the finely ground coal into microns (1/25,000 of an inch). These mix with oil and increase its energy content when used as a diesel fuel. The almost-invisible coal particles burn completely inside the cylinder.

Atomic-radiation experiments also are being carried out with fuels similar to No. 2 distillate oils. McBrian said that undesirable, slow-to-burn particles in such oils can be broken up to micron size and burned as efficiently as does diesel fuel made to rigid specifications.

Rio Grande scientists discovered the coal-oil process while working to develop an atomic-powered locomotive. McBrian estimated the fuel could save the railroad $400,000 a year.



Butadiene units above—and alkylation below mean . . .

Dual-Purpose Plant Goes On Stream

HOUSTON.—The first new butadiene plant built by private industry since the war is partially on stream.

Texas Butadiene & Chemical Corp. is operating the first of two 43,000-ton Houdry dehydrogenation process units at its new $30-million, dual-purpose plant outside Houston. The second unit will go into operation soon.

The Houdry units will produce butadiene as well as butylenes as feed for making aviation gasoline. The butylenes will be charged to an alkylation unit.

When all units are on stream, the plant will produce 61,000 tons annually of butadiene and about 2½ million barrels of aviation grade alkylate. Under an alternate yield plan, it can produce 86,000 tons annually of butadiene for use in synthetic rubber, textile, paint, and chemical industries.

Fluor Corp., in designing the plant, incorporated several major innovations:

. . . Axial flow compressors for the first time in a plant of this size are being used for hydrocarbon compression.

. . . A central hydraulic power system is operating the reactor valves. This is designed to permit quicker operation and more positive movement.

The Houdry dehydrogenation process is a single-step method. It employs an alumina-chrome oxide catalyst which transforms fresh butane and a butane-butene recycle stock from the butadiene-recovery section into butadiene or butenes.

The mixed feed is heated before entering the catalyst chamber. The dehydrogenated gases then are compressed, passed through an absorber-stripper unit and fed to the butadiene-recovery section. Furfural is the agent used to extract the butadiene as it flows through the section.

Oil Has Biggest Share of U. S. Manufacturing

PETROLEUM is the largest single manufacturing industry in the nation.

This commanding position attained by oil was emphasized in a report on business operations in 1955 compiled by the National Industrial Conference Board. It shows:

...Five of the first 10 manufacturing companies were oil firms.

...Ten of the first 20 included oil companies.

...Twenty-one oil companies held 31½ per cent of assets attributed to the top 100 firms in the nation.

General Motors was rated the top manufacturing company in the nation. Its assets of $7.6 billion shaded those of Standard Oil Co. (N. J.) by a small margin. Jersey Standard had assets of $7.1 billion (see table).

Other companies in the top 10 were U. S. Steel, Ford, Du Pont, Socony Mobil, Standard of Indiana, Texaco, Gulf and Bethlehem Steel. General Electric led the second 10 followed by Standard of California, Union Carbide & Carbon, Chrysler, Westinghouse, Shell, Sinclair, Phillips, Cities Service, and Alcoa.

Many other oil companies showed up in the first 100 ranking manufacturers.

They included Atlantic, thirty-eighth; Sun, forty-sixth; Union, forty-seventh; Continental, fifty-fourth; Tidewater, fifty-eighth; Sunray Mid-Continent, fifty-ninth; Pure, sixty-second; Ohio, seventy-seventh; Standard of Ohio, eighty-first; Richfield, eighty-fourth, and Skelly, eighty-fifth.

The major change in rankings of oil companies in 1955 resulted from the merger of Sunray and Mid-Continent. The merged company took over fifty-ninth place. Monsanto Chemical, largely through acquisition of Lion Oil, also jumped from sixty-third to forty-first place.

Oil companies played only a minor role in the second 100 U. S. companies. Only four were placed: Superior, 142nd.; Warren, 146th; Ashland, 151st.; and Getty Oil, 165th.

The Nation's 20 Biggest Manufacturers

(Dollar figures in millions)

		Total assets	Net worth	Invested capital	Sales*	Income before taxes†	Federal income taxes	Income after taxes	Dividends paid	No. of stockholders	No. of employes
1	General Motors Corp.	7,589.3	4,173.4	4,473.4	12,443.3	2,542.8	‡1,353.4	1,189.5	605.2	565,408	624,011
2	Standard Oil Co. (New Jersey)	7,164.1	5,091.9	5,694.6	6,272.4	824.3	115.0	709.3	342.8	324,220	153,000
3	United States Steel Corp.	3,967.2	2,582.6	2,868.7	4,079.8	736.1	366.0	370.1	148.1	310,975	272,646
4	Ford Motor Co.	3,183.1	1,869.1	1,869.1	5,594.0	967.3	530.3	437.0	174.7	318,774	181,616
5	Du Pont	2,483.6	1,971.0	1,971.0	1,909.2	744.6	313.0	431.6	328.7	159,009	§87,453
6	Socony Mobil Oil Co., Inc.	2,361.9	1,850.8	2,031.9	1,721.0	250.3	42.9	207.4	87.5	174,301	43,846
7	Standard Oil Co. (Indiana)	2,342.9	1,713.6	2,104.9	1,781.3	200.4	43.3	157.1	56.0	132,800	51,520
8	Texas Co.	2,184.6	1,694.7	1,903.7	1,767.3	313.0	50.3	262.7	116.6	120,376	42,462
9	Gulf Oil Corp.	2,160.8	1,528.5	1,714.9	1,895.7	325.7	¶107.7	218.1	57.5	81,717	47,228
10	Bethlehem Steel Corp.	1,998.7	1,186.1	1,548.5	2,096.6	361.2	181.0	180.2	76.0	104,464	144,853
11	General Electric Co.	1,864.8	1,054.1	1,089.7	3,442.5	374.9	177.3	197.6	145.9	338,563	214,794
12	Standard Oil Co. (California)	1,855.6	1,527.2	1,605.8	1,277.8	276.3	45.2	231.1	90.3	119,793	36,369
13	Union Carbide & Carbon Corp.	1,372.0	732.9	1,142.9	1,187.5	276.6	135.9	140.8	87.2	114,310	70,000
14	Chrysler Corp.	1,362.9	652.1	777.1	3,466.2	218.6	118.5	100.1	34.8	87,732	176,356
15	Westinghouse Electric Corp.	1,287.7	797.6	1,125.0	1,441.0	84.1	41.3	42.8	34.8	119,086	115,857
16	Shell Oil Co.	1,270.5	814.8	1,016.3	1,484.1	195.8	70.2	125.5	55.1	19,025	38,845
17	Sinclair Oil Corp.	1,250.1	831.1	1,079.3	1,110.1	115.4	34.7	80.7	36.6	110,148	24,657
18	Phillips Petroleum Co.	1,201.9	901.1	1,019.3	910.8	129.7	34.5	95.2	47.0	90,246	25,208
19	Cities Service Co.	1,120.0	577.0	968.3	923.2	74.5	25.2	49.3	20.8	177,000	.....
20	Aluminum Co. of America	1,070.5	555.1	863.5	845.0	155.3	67.7	87.6	23.9	20,257	55,000

*Include various methods by which companies report sales. †After state and foreign except where these taxes are not segregable from federal income taxes. ‡Includes foreign income taxes. §Not including employes at government-owned plants. ¶Includes other income taxes.

Second offshore tragedy in month . . .

...Barge Capsizes, 9 Lives Lost

NEW ORLEANS.—The second major disaster within a month hit the offshore oil area last week when a drilling barge capsized near the mouth of the Mississippi River.

Nine of the 15 crew members aboard are missing and presumed dead.

The $1,250,000 barge was owned by Golden Meadow Well Service Co. It was being towed by two tugs when it suddenly overturned.

The vessel had been moved from a Humble Oil & Refining Co. location where wave action had washed away part of the shell bed under the structure. While the barge was under tow high winds arose, causing the derrick to list. Weight of the derrick, coupled with the force of wind and waves, pulled the vessel over.

Site of the accident was about 2 miles east of the South Pass of the Mississippi River, in water about 28 ft. deep. Lines from the tugs were cut by crew members as the vessel started to capsize. The tugs rescued six of the crewmen. Three other members of the drilling crew were reported drowned. The other six were presumed to have drowned or suffocated inside the hull.

Divers searched the submerged portion of the hull in an attempt to rescue any survivors. After working most of the night, they failed to find any of the missing crew.

The barge, known as the "Mister K," was commissioned last summer. It was of conventional design for shallow-water, submersible barges.

In terms of lives lost, the accident may prove to be the worst disaster yet in offshore oil operations. It occurred 2 weeks to the day after the giant mobile platform "Mr. Gus" capsized off the South Texas coast.

Golden Meadow Well Service Co., with principal offices in Houston and New Orleans, operates two other offshore drilling rigs. Principal owners of the firm include Lewis Geer, New Orleans, and Floyd Karsten, Houston.

RAGS-TO-RICHES story of Wilshire Oil Co. of California was authored by Earle W. Allen, seated, vice president, and Robert O. Anderson, president. Anderson is also president of Malco Refineries, Inc., which bought out Wilshire in 1955.

Wilshire Bounces Back

● With new processing equipment and 172 new stations, it's an entirely different firm than when Malco rescued it from liquidation 18 months ago

LOS ANGELES.—Wilshire Oil Co. of California, consigned to the junkyard 18 months ago, has become California's largest and most aggressive refining-marketing independent.

Last week Wilshire put on stream a 10,000-bbl. Unifining-Platforming unit at its 30,000-bbl. Norwalk refinery. And it completed the purchase of 172 service stations from Sunset International Petroleum Corp.

Wilshire isn't finished. Within a year it will put on stream a 4,400-bbl. hydrofluoric alkylation unit. This will be a converted sulfuric-alkylation unit which has been in mothballs since the war.

The new service stations, formerly Golden Eagle and Craig, give Wilshire the second largest chain of company-operated stations in the state. The acquisition added 550 employes and doubled Wilshire's payroll.

Wilshire will market three grades of gasoline—Wilshire Economy (88 octane), Wilshire Economy Premium (93 octane), and Wilshire Premium (98 octane).

The company has set up a new affiliate, Wilshire Products, Inc., to handle its marketing outlets. There are now 425 stations marketing products under the Wilshire label.

Amazing recovery . . . These two events last week—putting on stream a new Platformer and purchasing 172 gas stations—were just the latest of an amazing series of events which have marked Wilshire's rebirth.

A year and a half ago, the prospect of Wilshire becoming California's largest and most rapidly growing independent couldn't have been more remote.

The death knell was supposedly sounded February 10, 1953. A policy of liquidation was announced for the company founded by the three Machris brothers in 1914.

This policy was quickly implemented as Monterey bought Wilshire's 13,000-bbl. daily production in California and Texas. The next move saw Wilshire Oil Co. of Texas buy its unproved acreage.

The company appeared to be going down for the last time in October 1955. All the remaining physical assets were ordered sold and the funds distributed to the stockholders.

At that point, the company consisted of a 22,000-bbl. refinery at Norwalk, some crude and products pipelines, and a small marketing system. With the disposal of the plant, Wilshire was slated to cease to exist.

This was the cue for Malco Refineries, Inc., of Roswell, N. M. to enter.

Malco bought the entire package. But rather than becoming chief mourner at Wilshire's wake, Malco turned out to be just what the dying patient needed.

A $4,000,000 rejuvenation was announced. It included.

. . . The Unifining-Platforming unit just completed.

. . . A $1,000,000 marine unloading line with onshore facilities at Huntington Beach.

. . . A long-term crude-import contract when tanker rates were at their lowest.

The new owners were quick to prove their plans weren't just idle talk. All the improvements announced have been completed in the short time since Malco officially took over Wilshire in November 1955.

Key to success . . . The key to Wilshire's revitalization is at the executive level. Serving in the dual capacity of president of both Wilshire and Malco is Robert O. Anderson. Earle W. Allen is vice president of Wilshire.

These two (Anderson, 40, and Allen, 43) have been associated since 1953 when Malco, largely owned by Anderson, bought Allen's New Mexico Asphalt & Refining Co. of Artesia. They make an interesting team.

Anderson is a sound, conservatively dressed businessman from Chicago. He speaks of financial matters with the assurance of one born to such things. His father pioneered oil-industry financing in Chicago.

Allen is a soft-spoken Texan with an extensive background in refining and marketing in both East Texas and New Mexico.

One common characteristic is that of frankness. You get a straight answer to a direct question from either.

At the time Malco purchased Wilshire, Anderson conceded that the company's new policy of becoming a heavy importer "is not going to make us very popular with domestic producers."

More coming . . . Last week's developments are far from the end of an expansion program. It's more like the beginning, according to Anderson.

Anderson recently revealed he is shopping for a refinery site in Hawaii. Malco and Wilshire are investigating the petrochemical field, specifically isobutane production. A long-range program for Wilshire's Norwalk refinery is designed to increase capacity to 45,000 bbl.

And judging from the performance record thus far, these projects are practically a cinch to be completed.

Oil Lift Suspended

U. S. steps out, leaving supply job to industry

WASHINGTON.—Europe's oil crisis has been licked, and the government oil lift has shut down.

The Interior Department last week closed out the industry-government plan of action under which U. S. oil has been moving to Europe since early last December. The schedules under which the industry has been operating were not canceled, however. They merely were suspended to be held in standby against a new emergency.

More than 80 million barrels of crude and products have been shipped to Europe since November 1. First shipments were made by the industry itself in an effort to keep the European economy going. Beginning in December, however, the oil lift was handled under government-approved schedules permitting pooling of tankers and other joint action by oil firms.

Tanker shipments through the Suez Canal have not yet moved in volume, Assistant Secretary of Interior Felix E. Wormser said. But the oil lift from this country has reached such a degree of effectiveness that Europe's supply from now on can be met by the industry without government supervision.

Refiners Get Tax Writeoffs

WASHINGTON.—Four more refiners received certificates of necessity this month for new facilities.

A new alkylation unit, to be built at Phillips Petroleum Co.'s Kansas City refinery, will cost an estimated $5,475,000. The full amount was granted rapid amortization, together with 65 per cent of $750,000 and 40 per cent of $300,000 in additional plant facilities.

At Buffalo, Socony Mobil Oil Co. will get fast writeoff on 65 per cent of $2,480,000 and 45 per cent of $410,000. A 2,900-bbl. per day sulfuric acid alkylation unit is being built at that refinery.

Esso Standard Oil Co. is adding a 7,200 bbl. per day Powerforming unit and a Hydrofining unit of the same size at Everett, Mass. Rapid writeoff was granted on 65 per cent of $3,285,400 and 45 per cent of $1,489,600.

Delhi-Taylor Oil Corp. is expanding Platforming capacity and adding 15,000 bbl. per day in Unifining facilities at Corpus Christi. Part of this will get fast amortization: 65 per cent of $500,000 and 45 per cent of $185,000.

Processing Briefs

Phillips Petroleum Co. will install new catalytic reforming units at its refineries at Sweeny, Tex., and Woods Cross, Utah.

The big Sweeny plant will get its second 16,000-bbl. cat reformer. Fluor Corp. has the contract. Construction will begin late this summer. Procon, Inc., has the contract for the proposed 3,700-bbl. unit at the Woods Cross refinery. Construction will begin early this fall. Completion for both units is set for next spring.

Clark Oil & Refining Corp. is adding a 12,500-bbl. U.O.P. fluid catalytic cracker at its 30,000-bbl. Blue Island, Ill., refinery. A $7¼-million design and construction contract has been awarded to Procon, Inc., which will start work about May 1. Completion is scheduled for early 1958. Procon also has the contract to build gas-concentration facilities in conjunction with the cat cracker.

Cooperative Refinery Association is upgrading its 10,000-bbl. refinery at Phillipsburg, Kans. The company has let a $1¼-million contract to Southwestern Engineering Co. of Los Angeles for construction of a 3,500-bbl. Platformer and 3,500-bbl. Unifining unit. Both are U.O.P. units. Completion is scheduled for December.

New capacity at Seadrift, Tex., has more than doubled the ethanolamine production of Carbide & Carbon Chemicals Co. Now supplied from Seadrift as well as the established facilities at South Charleston, W. Va., Carbide is also expanding capacity for ethanolamine derivatives. Morpholine, made by dehydrating diethanolamine, has already doubled in capacity and other expansions will follow this program.

Shell Oil Co. will build a Platforming unit equipped with a hydrodesulfurizer at its Norco, La., refinery. The units will be capable of processing about 12,000 bbl. daily. Contractor has not been announced, but Foster Wheeler Corp. and J. F. Pritchard Co. will build auxiliary facilities. Completion is slated for the summer of 1958.

Surpass Petrochemicals, Ltd., is nearing completion on a $1-million plant at Scarborough, Ont., to make petroleum sulfonates. When it goes on stream in June, it will produce Canada's first sulfonates. Capacity will be about 7 million pounds per year. The plant's capacity also includes 26 million pounds of lithium-based greases and 5 million pounds of inhibitors.

Esso Research & Engineering Co. has acquired from Houdry Process Corp. a license for production of butadiene, butanes, and other light olefins. The fixed-bed Houdry Dehydrogenation process will produce olefins in a single step from normal butane or butane-butene mixtures.

Also for Refiners . . .

Independent study of the imports problem is being made by Mobilization Director Gordon Gray so he can form his own opinion on what should be done. Meanwhile, former director Arthur S. Flemming warns that if importers don't cut the flow of oil into this country the only alternative is federal control (P. 80) . . . Amoco will dedicate its new refinery at Yorktown, Va., this week (P. 82) . . . Denver & Rio Grande Western Railroad has found a way to burn coal in a diesel fuel (P. 85) . . . First privately financed butadiene plant since the war has been put partially on stream at Houston by Texas Butadiene & Chemical (P. 86) . . . Petroleum has become the largest single manufacturing industry in the nation (P. 87) . . . Wilshire Oil of California is staging a quick comeback. It has put new processing units on stream and bought 172 new service stations (P. 88) . . . Europe's oil crisis is over and the Government has shut down the oil lift, leaving the supply job now to private industry (P. 89) . . . Cosden is tying its plants at Hawley, Big Spring, and Colorado City in West Texas into the Wichita Falls market by a 128-mile, 6-in. products line (P. 95) . . . The Venezuelan Government will spend $300 million within the next 4 years on a petrochemical complex at Puerto Cabello (P. 97).

PLUS THESE TECHNICAL FEATURES: A look at electrical valve operators. The final control element has been tough to convert, but there are several on the market and more on the way (P. 108) . . . How to beat corrosion downstream from the reactor on alkylation units (P. 116) . . . The Foreman's Page (P. 144) . . . Field processing (P. 147) . . . Refiner's Notebook (P. 148) . . . and Questions on Technology (P. 149).

SOCAL cut filter costs at the West Coyote flood after learning that . . .

Filterless Floods Pay Off

LOS ANGELES.—Why use a filter in water flooding when materials left in the water may improve the injectivity profile?

Engineers of Standard Oil Co. of California, Western Operations, Inc., think that filtering is an unnecessary frill at some floods. So they are cutting expenses by not using filters at three projects in the Los Angeles Basin.

Standard-Western's decision stems from tests with selective plugging agents. As was largely the case with selective plugging, there is little evidence of well plugging after a year's experience.

As Engineer K. M. Holland explained it at a recent meeting of Society of Petroleum Engineers (A.I.M.E.), well plugging may be caused by silt and insoluble organic materials in the water. Because of the experience with granular and chemical agents, well plugging was not believed to be a serious problem at the three floods.

If it did occur, the plugging might well be selective and beneficial. If it became serious, permeability could be retained by back-flowing, shooting, or other measures.

Since filtration accounts for about one-half the total water-treating and handling cost, use of unfiltered water is much cheaper.

However, Holland urges caution. Unfiltered water can't be used universally. But where selective plugging fails to plug injection wells, filters should be regarded as unnecessary.

How it started . . . Standard-Western's first experience was at a one-well project. Filtering was stopped because of the high treating cost and trouble with the filter plant. And, too, it was thought plugging would not be a problem because of the poor results obtained with plugging agents.

Here's what happened: More than 1,000,000 bbl. of unfiltered water was injected during the past 3 years. There has been no sign of plugging despite the fact that water completely plugged the filter on a Cerini test.

Based on this experience, filtration was abandoned at the three floods in Los Angeles Basin. Chemical treatment for corrosion and bacteria is used, and moderate cleaning is obtained by gas bubble towers. There has been no plugging after a year's injection.

The three floods are in West Coyote, Inglewood, and Torrance fields. Daily volumes of injected water are 24,500, 9,300, and 1,000 bbl. respectively.

The company may extend the Inglewood flood. Plans call for an open system and no treating. Because of the low sulfate content and the high B.O.D. (biological oxygen demand) of the water, oxygen in the system will probably be consumed prior to injection.

Use of the open system without filtering will result in an $87,000 saving in capital outlay.

Oil's Future Good

McGee says it will stay on top for next 25 years

HOUSTON.—When nuclear power becomes a common source of energy, oil and gas may be even more valuable than they are today.

W. C. McGee, Jr., senior vice president for Tennessee Gas Transmission Co., predicts that oil and gas some day will be "much too valuable to burn."

The pipeline executive spoke last week at the twenty-ninth annual conference of the Petroleum Industry Electrical Association and the Petroleum Electric Supply Association.

He pointed out that in the early days of the United States wood was its chief source of energy. Wood was gradually replaced by coal, and coal has been largely replaced by oil and natural gas which now furnish about 68 per cent of our energy needs.

"It is only natural to assume that our two most popular fuels of today will some day fall from grace in favor of nuclear power," McGee said. "And I believe that is a correct assumption.

"Some of these days we will find petroleum and its products much too scarce and much too valuable to burn. Just as wood products are valuable today, not as a fuel but for other uses, so will be petroleum products in the future."

McGee pointed out that petroleum already is being used widely as a raw material in manufacture of petrochemicals.

The speaker predicted that oil and natural gas will remain the dominant sources of energy in the United States for the next 25 years. By 1975, consumption of natural gas is expected to double the current rate while oil consumption is expected to increase at only a slightly lesser rate.

"To supply these needs," he warned, "there must be further advances in petroleum equipment. Development in the design and engineering of equipment and devices must keep pace with the demands thrust on the industry by our booming population and economy," he said.

Seeligson, Abell Floods Sought

AUSTIN. — Two more large water floods are in the works in Texas.

Humble Oil & Refining Co. last week proposed a flood of Zone 20-E of the Frio underlying its wholly owned 1,960-acre lease in big Seeligson field in Kleberg and Jim Wells counties of South Texas.

Meanwhile, William B. Neely and George T. Abell were seeking a permit for a flood of the Devonian underlying Abell (Devonian) field in Crane and Pecos counties of West Texas.

Humble's Vernon Sage told the Texas Railroad Commission Humble is having trouble in the 6,600-ft. zone 20-E from an expanding gas cap. The company wants to replace with water all fluids voided from the reservoir. This would prevent the gas cap from expanding further.

Humble figures it can thus increase recovery 116 per cent over primary operations.

The 20-E zone now has 19 producing wells on a 73-acre spacing pattern. Its first well was completed in June 1943. Pressure since then has dropped to 2,400 psi. from 3,187 psi.

Humble will inject about 1,200 bbl. of water daily from the 3,000 to 3,500-ft. Catahoula zone through its King Ranch-Seeligson E-35 well. Water will be injected at 2,500 psi. below 20-E's oil-water contact in the interval 6,760-88 ft.

Abell Plans . . . Neely and Abell hope to hike oil recovery in Abell Devonian to 54.7 per cent of the original oil in place.

This field takes in only 245 acres, but has an unusually thick pay section—a maximum of 300 ft. and an average of 178 ft. of Devonian.

It is a fault-block pool with at least three blocks. Pressure differential across the faults runs as high as 600 psi.

The pay, however, isn't as productive as one this thick is usually expected to be. It produces under a solution-gas drive.

Operators figure injection of about 1,500 to 2,000 bbl. of water daily will be required in the near future to keep field pressure at or near the bubble point of 2,131 psi.

They asked that field spacing be cut from the present 20.4 acres per well to 10 acres due to the field's unusual shape, its thick pay, and other factors. Operators said this is necessary to conduct the flood properly. Neely and Abell plan to drill 15 new producing wells if the spacing change is made.

The cut in spacing, they said, should be accompanied by a cut in allowable to 72 bbl. per well per day from the present 102 bbl. daily.

Motorized Efficiency Expert: Sun Oil Co.'s laboratory-on-wheels promises to provide a quick and accurate picture on performance of any refining unit. It's equipped with such high-speed electronic computing equipment as a data logger, frequency response apparatus and vapor-phase chromatograph. These can analyze unit operations on the spot. The lab still is in its shakedown stage. It is shown here being tied into a unit at the Marcus Hook refinery. Other tests have been made at Sun's Toledo plant. Officials expect the final result to be a new short-cut to solving plant design and operating problems.

Offshore Bid High

Shell, Continental offer $12 million for tidelands

HERMOSA BEACH, Calif. — A $12,175,000 joint cash offer by Shell Oil Co. and Continental Oil Co. topped three others in bidding for drilling rights on this city's tidelands. The city council set June 17 as the date for its decision on the bids.

The Shell-Continental offer was for a 35-year exclusive development lease, rental of onshore drill sites, and a cash bonus.

Other bidders were Edwin Pauley, $1,305,000; Standard Oil Co. of California, Western Operations, Inc., $8,199,979; and Bandini Oil Co. and Associates, $4,600,000.

Hermosa Beach holds title to its tidelands under a state grant similar to that of its Santa Monica Bay neighbor—Redondo Beach.

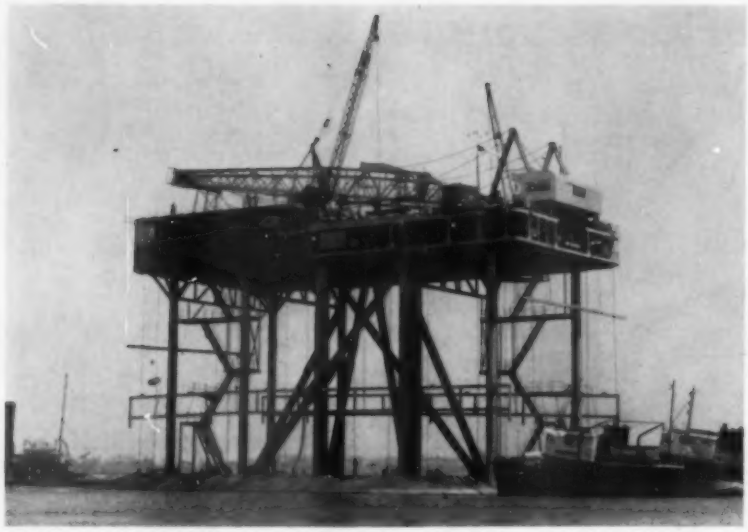
Bidders were notified that if a lease is awarded, successful bidder will have to foot the bill for a special election to repeal a 1929 city ordinance against drilling in the city limits. Extensive soundproofing and site beautification restrictions will also be imposed.

Berry Plant Gets New Unit

GARY, Ind.—A combination Unifining and Platforming unit has gone on stream at Berry Asphalt Co.'s 6,000-bbl. refinery here.

The combination unit will permit the company to turn out leaded gasoline with an octane rating of 98. The refinery operates on high sulfur content Wyoming crude. The Unifining section will serve as a pretreating facility for the Platformer, which has a design capacity of 1,650 bbl. per day.

The unit was designed, engineered, and licensed by Universal Oil Products Co., Des Plaines, Ill.



Tidelands Newcomer Launches Barge

MOBILE, Ala.—Coral Drilling Co.'s $4,500,000 submersible drilling vessel, the "Mr. Arthur," has completed its shakedown cruise and is ready to start work in the tidelands off Louisiana.

Designed to drill in water as much as 70 ft. deep and to depths of more than 20,000 ft., the new barge is under contract to The California Co. It was on location last week for its first well, in Main Pass Block 45. The vessel was designed by Friede & Goldman, Inc., New Orleans, and built by Alabama Dry Dock & Shipbuilding Co., Mobile.

Coral Drilling Co., with headquarters in Fort Worth, is a newcomer in the tidelands oil search. Among its principal stockholders are Arthur O. Wellman and Arthur O. Wellman, Jr., of Boston; Cosden Petroleum Corp., Big Spring, Tex.; and Ted Weiner, Fort Worth.

Tax on Gas Reserves Doomed

AUSTIN.—Gas trunk lines apparently have escaped again this year from the oft-threatened Texas tax on gas reserves dedicated by contract.

A bill providing such a tax amounting to 0.75 cent an M.c.f. had been introduced in the house and endorsed as a revenue measure by Gov. Price Daniel should it become apparent that Texas needed more tax money this year.

The bill admittedly faced a tough fight. Many Texas legislators are dragging their feet on any new taxes. Last week, an apparent bonehead by the bill's author, Rep. Tom Joseph of Waco, appeared to have sealed its doom.

Joseph forgot to include the vital "enacting clause" in the bill when he introduced it in the house. A bill cannot become law in Texas without this clause. When the omission was discovered, the house refused to suspend its rules to permit Joseph to correct the bill.

Backers of the bill have two choices left. They can ask the house to suspend its rules to allow Joseph to introduce a new bill with the enacting clause. As a last resort, they can ask Governor Daniel to submit the subject of taxation as an emergency—then introduce a new bill.

Neither route appears to have much chance of success.

Pooling bill dead . . . A bill permitting the Texas Railroad Commission to force operators to join drilling units under certain conditions *(The Oil and Gas Journal, March 4, page 65)* also appears dead.

Its author, Rep. R. C. Slack of Pecos, said last week he is sure the bill will not be reported out of committee. The pooling bill was referred to the house oil, gas, and mining committee after public hearing March 19.

The oil industry in Texas is virtually certain now to get by the next 2 years with no tax increase of any kind.

It is one of the few times oil men have emerged unscathed.

Microwave's Future

Big changes are overdue, radio engineers are told

HOUSTON.—Many changes lie ahead for the private microwave system industry which strangely has recorded very few advances in the last few years.

F. Vinton Long of Texas Eastern Transmission Corp. held out that prospect in an address before the ninth annual Southwestern Institute of Radio Engineers Conference.

Long said microwave technology has not kept pace with scientific gains in other industries. He explained this is partly due to lack of demand for improvements by equipment users and partly to manufacturers who are inclined to make very few changes in their products.

Long declared, however, gains are bound to come. For the high density, long-haul microwave systems, he predicted these modifications:

. . . Transistors will become more important and practically all equipment except U.H.F. will be outfitted with them.

. . . Direct current will replace alternating current, especially at relay stations. The day of the erratic and cranky standby a.c. power plant has come and gone. Continuous power is a necessity and if standby plants are used, they will be of the d.c. variety in order to charge storage batteries which will operate the stations.

Big changes . . . The real revolution will come in the short-haul telemetering links or the low-density, medium-haul relay links.

Simplicity will keynote these changes:

. . . Tower lights will disappear by limiting tower heights to 170 ft. This will mean eliminating standby tower-light plants and elaborate lighting-alarm systems.

. . . Stations will be in accessible locations.

. . . Individual plug-in units will be used to permit quick removal for service and repair at a central shop.

. . . Entire station will operate on 12 or 24-volt d.c. storage batteries since power requirements will be curtailed.

. . . Tubes eventually will be eliminated even on U.H.F. equipment.

. . . Multiple channels will be avoided.

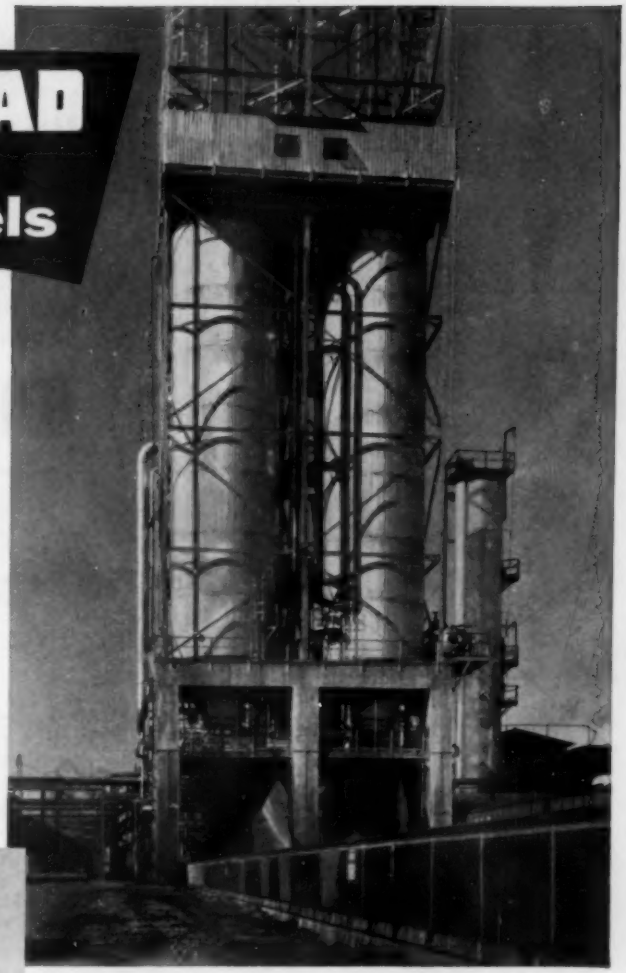
Long also predicted that higher frequencies will come into the picture. He said frequency congestion has caused much comment and needless concern, adding there are plenty of frequencies available for everyone.

HORTONCLAD and CB&I Vessels

Hortonclad Plates Utilized in fabrication of crude fractionator and coking chambers

Hortonclad®, a composite corrosion-resistant metal having an integral and continuous bond produced by a high vacuum brazing process, was used in the fabrication of the two process vessels shown here, built by CB&I.

Hortonclad, available only with CB&I storage and process vessels, may be had in silver, nickel, stainless steels (both chromium and chromium-nickel) and a wide variety of other metals and alloys. Further information on its use with CB&I vessels may be obtained by writing our nearest office.



▲ **405 STAINLESS STEEL HORTONCLAD** was used in the fabrication of these two 16-ft. diam. by 65-ft. high coking chambers by Chicago Bridge & Iron Company.

◀ **MONEL HORTONCLAD and CHROME-NICKEL STAINLESS HORTONCLAD** were used in building this 15½-ft. by 142-ft. crude fractionator by CB&I. The top head and upper portion of the shell was Monel Hortonclad. Chrome-nickel stainless Hortonclad was used in the bottom head and lower portion of the shell.

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JOHN WIGGINS' ANSWERS TO 8 QUESTIONS CAN HELP YOU SELECT A BETTER FLOATING ROOF SEAL

Are all floating roof seals the same? What about safety? Conservation? We asked John Wiggins, inventor of the floating roof and noted conservation authority, to answer questions most commonly asked about the new Wiggins Safety Seal.

1—**Q.** In the new Wiggins Safety Seal does any of the mechanism contact the liquid?

A. No. All metal working parts are out of the liquid away from corrosive vapors.

2—**Q.** Does the new "Weather Hood" provide longer fabric life?

A. Yes—the fabric is protected from the sun and other elements—lower temperature under the hood provides added conservation.

3—**Q.** In old style seals, rust and scale accumulate and shorten seal life. Does this happen with this seal?

A. The "Weather Hood" prevents rust and scale from depositing in the "seal loop"—thereby increasing seal life.

4—**Q.** Does the Wiggins Safety Seal prevent rim fires?

A. Yes—design of the seal virtually eliminates critical vapor spaces where air and vapor collect to form explosive mixtures. When exploded through controlled tests, the fabric was able to expand enough to contain the explosion without tearing.

5—**Q.** Is this seal safe for the storage of low vapor-pressure, low flash-point liquids such as jet fuels?

A. Yes, the design of the Wiggins Safety Seal reduces the danger area to a minimum so that it can be used in the storage of jet fuels with complete confidence.

6—**Q.** How does the Wiggins Safety Seal guarantee maximum protection against evaporation loss?

A. Air-vapor volume of the Safety Seal is less than 10% of the present volume for floating roof seals. This would eliminate most losses. In addition, the air-vapor space is shielded by a "Weather Hood". This area—the area that breathes—reduces losses to a minimum.

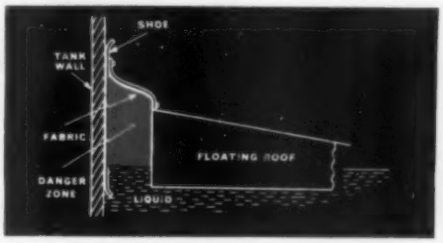
7—**Q.** Will the Wiggins Safety Seal save me money?

A. Yes—by eliminating losses due to thermal breathing, preventing rim fires, use of new longer-lived fabric, protecting the mechanism from liquid and corrosive vapors and permitting much longer periods of "in-service" operation.

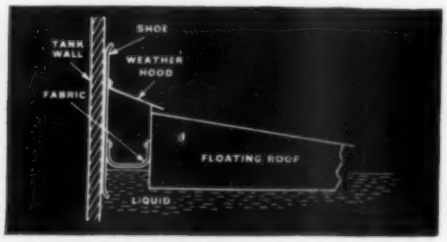
8—**Q.** Why have you put so much emphasis on the seal?

A. A floating roof is only as safe as its seal. With the new Wiggins Safety Seal, Wiggins floating roofs are in a class by themselves. Since General American makes all types of floating roofs, you can have the Wiggins Safety Seal on the roof that best meets your needs—whether it be the Wiggins Hidek*-Lodek* or Doubledek*.

*Patented



OLD
With the old type seal, the fabric is exposed to the sun's rays and explosive vapor collects in the large space between the liquid and the fabric; the mechanism is submerged in the liquid and exposed to corrosive vapors.



NEW
With the new Wiggins Safety Seal, vapor space under the circumferential fabric is reduced to a minimum. Ends spark fire hazards. Fabric is protected from the sun. Mechanism is out of liquid and corrosive vapor space.

To see why Wiggins Floating Roofs pay for themselves, write or call your General American sales engineer.

PLATE AND WELDING DIVISION

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South La Salle Street, Chicago 90, Illinois

Cosden Adding Line

Products from Hawley plant will move to Wichita Falls

BIG SPRING, Tex.—Cosden Petroleum Corp. will enter the Wichita Falls market this fall with an 8,000-bbl.-daily products line from the Abilene area.

The 128-mile, 6-in. line is being designed by Pipe Line Technologists, Inc., Houston. It will extend from Cosden's Hawley refinery, just outside Abilene, to Wichita Falls, where a terminal with eight 20,000-bbl. tanks and two 10,000-bbl. tanks will be built.

Pipe delivery is scheduled for July and construction will take around 90 days. A pump station will be built at Hawley.

Cosden will erect segregated tankage for customers whose products will be refined to specification and market the remainder itself. A subsidiary, Trust Pipe Line Co., is building the project. The pipeline will cost $2 million and the terminal $550,000.

The move gives Cosden greater flexibility and growth opportunity through access to a market outside its West Texas area. The present pipeline system links Cosden plants at Big Spring, Hawley, and Colorado City. Products can be shipped from all three plants to Wichita Falls. Throughput can be stepped up by adding horsepower at the Big Spring and Hawley stations.

Gulf Interstate Expanding

WASHINGTON.—Gulf Interstate Gas Co. has received temporary approval from the Federal Power Commission to add 69,000 hp. to its system and reach ultimate design capacity of 575,000,000 cu. ft. daily.

The expansion includes the industry's largest single installation of engine-driven centrifugal compressors, whose use in remote-controlled operations has been pioneered by Gulf Interstate. The company will install 49,000 hp. at five engine-driven centrifugal stations on the 845-mile, 30-in. line from Louisiana to Leach, Ky., and 20,000 hp. at the five original reciprocating stations *(The Oil and Gas Journal, February 11, page 80)*.

The project, to cost $24 million, will be completed November 1. It also includes a 300-hp. compressor station at East Mud Lake field in Cameron Parish, Louisiana, and 10 miles of gathering line from Erath field. Tentative approval by the FPC did not authorize operation of the new facilities.

Pipeline briefs

Signal Oil & Gas Co. is extending the gathering system which brings gas to its Tioga, N. D., gasoline plant. It is adding 80 miles of line to take gas from Antelope, North Blue Buttes, and the northern half of South Blue Buttes field. It will increase throughput 8,000,000 cu. ft. to 48,000,000 cu. ft. daily.

C. P. Barney & Son, Tioga contractor, is to complete the work by October 1. The system now serves 576 wells in Tioga, Beaver Lodge, Capa, Hofflund, and Charlson fields.

Rangeland Pipe Line Co. has resumed work on the 47.5-mile, 12-in. extension of its crude line from Gilby southward to the Sundre field area of South Central Alberta. Dutton-Williams Brothers, Ltd., the contractor, expects to complete the project by June 15. Throughput is to be 3,300 bbl. daily at first and 10,000 bbl. daily later.

Westcoast Transmission Co. has awarded contracts to Dutton-Williams Brothers for three compressor stations on the 650-mile, 30-in. line from the Peace River area of British Columbia and Alberta to Sumas, Wash. Dutton-Williams will build the McLeod Lake and Australian stations jointly with Stearns-Roger Co. Completion is scheduled September 1. Dutton-Williams is the sole contractor on the Savona station.

Magnolia Petroleum Co. has awarded contracts for looping projects along its Midland to Beaumont crude line. O. R. Burden Construction Corp. will lay 126 miles of pipe, including 121 miles of 16-in. and 5 miles of 12-in. between Midland and Corsicana. H. B. Zachry Co. has 77 miles of 12, 16, and 20-in. along the rest of the route. The looping, to be started in August, and addition of pumping equipment will raise Magnolia's capacity out of Midland 75,000 bbl. daily to 235,000 bbl. daily.

El Paso Natural Gas Co. expects to start laying two new gas lines in Texas and New Mexico soon, perhaps next month. One is 47 miles of 30-in. from the proposed Lindrith, N. M., plant to the proposed Chaco, N. M., plant. Contract has been let to Foutz & Bursam Construction Co. The other line is 94 miles of 18-in. from the proposed Panoma compressor station in the Texas Panhandle to Dumas, Tex. R. H. Fulton & Co. will build this line, which is to be completed in July.

Southern California Edison Co. is building a 200-mile pipeline from Richfield Oil Corp. gas fields in the San Joaquin Valley to its new power plant at Redondo Beach. The contract may net Richfield $200-$300 million over the next 20 years.

The power company also has an agreement with Southern California Gas Co. and Southern Counties Gas Co. for exchange deliveries of gas which Edison plans to buy from El Paso Natural Gas Co. at Needles, Calif.

Also for Pipeliners . . .

The Harris-O'Hara natural-gas bill has Eisenhower's support but measure is still far from enactment. Many feel his active help will be needed. (P. 79) . . . A pipeline monopoly charge may be leveled against the oil industry next month by joint subcommittee investigating the European oil lift (P. 80) . . . Natural Gas Pipeline has added a 337-mile, 30-in. looping project to its expansion program (P. 83) . . . Plans for the world's largest offshore pipeline have been disclosed by T.G.T. (P. 84) . . . Work will begin this week on Tecumseh's 210-mile, 20-in. crude line from Griffith, Ind., to Cygnet, Ohio (P. 85) . . . Oil and gas some day will be much too valuable to burn, is prediction of T.G.T. Vice President W. C. McGee, Jr. (P. 90) . . . Cosden plans a 128-mile, 6-in. products line from Hawley, near Abilene, to Wichita Falls, Tex. (P. 95) . . . Aramco's new 140-mile, 22-in. crude line to Ras Tanura has opened the prolific Safaniya offshore field in Saudi Arabia to production (P. 98) . . . Mene Grande and Creole are building a 97-mile, 30-in. crude line in Eastern Venezuela which will increase capacity from Greater Oficina fields to Puerto La Cruz by 300,000 to 500,000 bbl. daily (P. 102).

PLUS THESE TECHNICAL FEATURES: Mechanization comes to pipeline welding. How H. C. Price Co.'s new technique keeps operations going through the worst kind of weather (P. 104) . . . A look at electrical valve operators (P. 108) . . . and Pipeline Patrol's rundown on how Mid-Continent simplified dispatching on one of the nation's largest crude-gathering systems (P. 157).

Ted Sutter and R. C. Baker share honors as . . .

Baker Relinquishes Top Post

LOS ANGELES.—One of oil's real old-timers is stepping out of active management of his company after 63 years in the oil business.

R. C. Baker (right, above) has turned over the presidency of Baker Oil Tools, Inc., to Ted Sutter (left).

The executives are shown at the shift-of-command ceremonies where Baker was presented a bronze bust and oil portrait of himself, both gifts of company employes.

Baker retained his position as chairman of the board while directors moved Sutter up to president from his post of executive vice president and general manager. All other directors and officers were reelected, including R. W. Henderson, vice president and assistant general manager in charge of the central division in Houston.

Baker, now 85, began his career in the oil industry in 1894. He drove a two-horse team hauling oil for $2 for a 12-hour day. Two years later he became a drilling contractor in Los Angeles fields and in 1899 moved into the Coalinga area.

By 1907 Baker was serving as superintendent for several oil companies and introduced the first rotary drilling equipment in Coalinga fields. He imported two rotary crews from Texas, where rotary operations had been initiated 6 years before.

It was that same year that Baker developed a casing shoe upon which his company later was founded. The Baker Casing Shoe Co. was organized in 1913 and purchased a machine shop in 1918 to manufacture the shoe and other specialties. There were only 3 employes then, but since the firm has grown to a world-wide organization employing 1,400.

It has plants and office buildings in California and Houston, 60 branch warehouses in the United States, and a wholly owned subsidiary, Baker Transworld, Inc., serving Canada and Venezuela.

New Drilling for Movie Lot

LOS ANGELES.—The way has been cleared for additional drilling on the Twentieth Century Fox movie lot in West Los Angeles. The Los Angeles city council overrode Mayor Norris Poulson's veto of an ordinance which will permit Universal Consolidated Oil Co. to slant-drill under an additional 35 acres from a soundproofed, landscaped drill site.

In vetoing the bill, Mayor Poulson said he feared Universal Consolidated's operations would drain crude from the city-owned 180-acre Rancho Golf Course. He said he wanted the bill held up until a committee studying leasing policies on city-owned lands submits recommendations. Consolidated already has 11 slant-drilled wells producing from the studio lot.

—— *Industry* briefs

Federal Royalty Co., Houston, has been sold to three Ohio companies for $7,111,111. The purchasers, all of Findlay, Ohio, are Differential Steel Car Co., Princess Powellton Corp., and Differential Corp. They are controlled by H. Fort Flowers, of Houston and Findlay. Federal Royalty has oil production in Harris County, Texas, in addition to widely scattered oil and sulfur royalties.

Atlas Pipe, Inc., will acquire the assets of Hardy-Griffin Engineering Corp. if Hardy-Griffin stockholders approve a cash and stock transfer announced last week. Atlas has offered 60,000 shares of its stock plus $25,000 for Hardy-Griffin holdings. The recently organized Hardy-Griffin firm makes and installs seal rings for oil-field tubular goods.

Houston Oil Co. of Texas has taken another step toward liquidation. Harold Decker, president, announced that $5,720,152 has been transferred to a New York bank for distribution to stockholders. Decker said the transfer "for all practical purposes" will be the last to Houston Oil stockholders. The firm's assets were sold last year to Atlantic Refining Co. and Time, Inc., in a deal involving about $225,000,000.

The largest lease sale ever held has just been completed by the Saskatchewan Government. Cash bonus bids totaling $4,199,086 were accepted for 26 of the 49 parcels offered covering 7,134 acres. Largest bidder was Imperial Oil Co., Ltd., which bid $1,187,514 on 10 parcels. Largest per acre bid accepted was $2,350 an acre for a 160-acre parcel made by Union Oil & Gas Corp. of Louisiana.

Montana's State Land Board has revised its leasing calendar. In the future, it will hold five regular lease sales a year. They will be held in March, June, August, October, and December. The first under the new program will be held late in August. Additional sales are possible if needed.

The state's next lease sale—scheduled before the new calendar was adopted—will be May 13. It has attracted applications for leases on 173 tracts covering 83,326 acres.

Sinclair Oil & Gas Co. is building a gas-gathering system and booster station 5 miles south of Farnsworth in Ochiltree County in the Texas Panhandle. A 500-hp. compressor will be installed to handle 2,500,000 cu. ft. daily of oil-well gas to be purchased by Northern Natural Gas Co.

PACKAGED REFINERY going to Venezuela as . . .

Chemical Complex Rises

● Venezuelan Government pouring $300 million into building program to industrialize Puerto Cabello area

THE Venezuelan Government is making rapid strides on a long-range program to erect a petrochemical and refining center in the Puerto Cabello area west of Caracas on the Caribbean.

A government agency, Instituto Venezolano de Petroquimica, has budgeted projects totaling about $300 million for the next 4 years in three stages. The timetable is:

. . . **First stage,** costing $75 million, calls for construction of a 10,000-ton chlorine and caustic soda plant, a 200,000-ton fertilizer plant, two sulfuric acid plants, a pilot refinery (see photo), and homes for 1,400 workers.

. . . **Second stage,** costing $75 million, includes plants for explosives, weed killers, insecticides, and fungicides.

. . . **Third stage,** costing $150 million, calls for a synthetic-rubber plant, plastics plant, and a commercial refinery of about 40,000 bbl. daily.

Progress . . . Work on the first stage of the program is already 60 per cent completed, with first production scheduled later this year.

The small, modern refinery is being shipped this spring from Houston for assembly on the site. The 3,000-bbl. daily plant was sold to the Venezuelan government agency by Tifco Inter-America Corp. The principal process units are mounted on skids to facilitate erection. Each is painted a different color. The connecting links are painted two colors to show which process units they will connect.

Several large pieces of equipment already have been shipped. Remaining units are expected to leave Houston by May 15. The plant is scheduled to go into operation next fall.

Venezuela will use the plant for research in refining heavy Venezuelan crudes and for training refinery personnel. The experienced workmen then will be used later when a bigger commercial-size refinery will be erected.

Other plans . . . Work also will start soon on a new natural-gas pipeline system.

It will bring new gas supplies to Caracas and to the steel-making areas of Puerto Ordaz and Ciudad Bolivar *(The Oil and Gas Journal, December 24, 1956, page 34).* The government will augment this system later by purchase of facilities of Venezuelan-Atlantic Transmission Co. which now serves the Puerto Cabello area. This will assure a raw material supply for the fertilizer plant and fuel for the other plants.

In addition, the government oil agency plans to revive the old Mene de Acosta oil field in the State of Falcon. Creole abandoned the field years ago as noncommercial. But the government plans a new drilling and secondary-recovery program to return the field to production.

What it means . . . The government explains that the project is an attempt to erect an integrated petroleum and chemical operation to take advantage of the region's resources in manpower and materials.

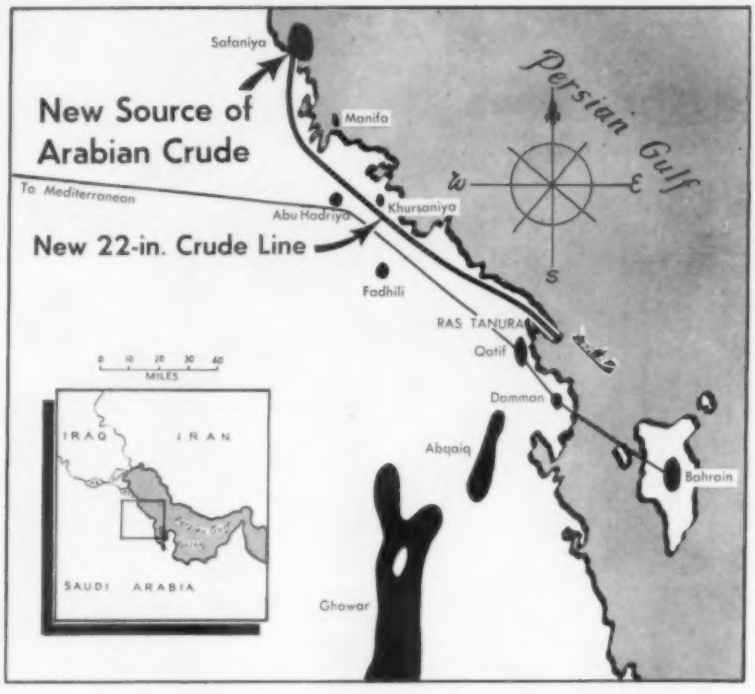
Officials declare the time has come in Venezuela's economic development for the nation to become an active participant instead of an "onlooker" in its industrial growth. In this light the project is viewed as a sweeping experiment. It's not only an investment in plant but also creation of a training ground for management and technical leaders.

Oil men, however, fear the Puerto Cabello complex may lead to the government's engaging in the oil business. The project will put a government agency in oil production, secondary recovery, pipelining, refining, and petrochemical manufacture.

Most of the petroleum and chemical products to be manufactured at Puerto Cabello will be exported. A big Venezuelan domestic market for these products is yet to be developed. Thus the government agency will compete with other refiners and marketers in the Caribbean and European market.

The project also will make Puerto Cabello a major refining center on the Caribbean. Socony Mobil is planning at 40,000-bbl. refinery there. Socony Mobil and Sinclair currently are building a 212-mile, 20-in. crude pipeline to Puerto Cabello from the Barinas-Apure basin *(The Oil and Gas Journal, November 12, 1956, page 142).* The line will have an initial capacity of 110,000 bbl. daily with expansion easily possible to 170,000 bbl.

The pipeline will supply the refinery as well as a new tanker terminal also being built. The terminal will handle the largest supertankers and provide crude storage.



World's Biggest Offshore Pool Starts Feeding New Crude Line

SAFANIYA, the Middle East's first offshore field and probably the biggest underwater oil field in the world, went on production last week. A flow of 50,000 bbl. daily started moving by pipeline to Ras Tanura.

By mid-1958, that flow will be stepped up to 175,000 bbl. daily. This is 50,000 bbl. daily more than the production target set by Arabian American Oil Co. less than 6 months ago *(The Oil and Gas Journal, December 31, 1956, page 182)*.

Discovered in 1951, Safaniya lies under the waters of the Persian Gulf off the coast of Saudi Arabia about 180 miles north of Dhahran. The field is about 20 miles long and 7½ miles wide. It produces from the Bahrain zone, a middle Cretaceous sandstone between 5,000 and 5,600 ft. At 27° gravity, Safaniya crude is the heaviest produced by Aramco and the only sandstone production.

The field now has 23 wells, 2 on shore and the other 21 in the waters of the Persian Gulf. Production from the field is gathered through a 12-mile, 16-in. submarine line up the center of the productive area. Wells are connected to this gathering line by 6-in. flowlines.

The production is now moving south to Ras Tanura through a 140-mile pipeline which has just been completed by Aramco. The pipeline serves both the Ras Tanura refinery and a loading terminal. This allows the crude to be processed in the Middle East or exported.

The world demand for heavy fuels and the fact that Safaniya crude yields a high percentage of this type of product has made Aramco increase its production target twice since the pipeline was planned. The second increase to 175,000 bbl. daily will mean the drilling of at least another nine wells in the field by the middle of 1958.

Aramco officials estimated last week that putting the new field on production has cost about $21 million, more than half of it for the pipeline to Ras Tanura. In addition to the $11 million pipeline, the company has built a pier, a gas-oil separator on shore at Safaniya, and a pump station.

The first load of Safaniya crude will be lifted at Ras Tanura about May 5 by the Japanese tanker Nissyo Maru.

Other developments . . . With Safaniya on production, Aramco will turn its offshore attention to another Persian Gulf structure which has not yet been tested.

Geophysical work has located what the company regards as a promising structure at Manifa Bay, about halfway between Safaniya and the new onshore field, Khursaniyah. Aramco has set no date for testing the structure, but it will not be delayed.

So far, only marine seismic work and some core drilling has been done. Actual drilling at Manifa may come as soon as the nine development wells at Safaniya have been completed.

If drilling proves the Manifa structure, Aramco will have a new production trend both on and offshore along the northeastern Persian Gulf coast.

In addition to the Khursaniyah discovery, the company has a deep one-well field at Abu Hadriya and another at Fadhili. Both fields are shut in. The two flank Khursaniyah about 18 miles to the northwest and the south.

Ecuador Plant Set

Domestic refining needs to be met with added capacity

WORK will start in 60 days at La Libertad on a new refinery designed to make Ecuador self-sufficient in refined products by mid-1958.

The plant will include a crude-distillation unit designed for 7,700 bbl. per stream day, plus a 6,000-bbl. daily thermal cracking unit. Designed by Universal Oil Products, Ltd., the new units will be engineered and built by Procon (Great Britain), Ltd., for Anglo-Ecuadorian Oilfields, Ltd.

Anglo-Ecuadorian is the country's largest crude producer. It now operates a 5,000-bbl. daily refinery at La Libertad.

The new refining capacity is a part of the contract signed by Anglo-Ecuadorian and the government last year. The company agreed to build the refinery and design it to be expanded to 10,000 bbl. daily by 1961.

In return, the government granted the company a new deal in which all its present development concessions in a 320-sq.-mile area near Santa Elena will terminate in 1977 with an option to add another 10 years at that time. Previous termination dates on the concessions ranged from 1971 to 1993.

The company is jointly owned by Lobitos Oilfields, Ltd., and South American Gold & Platinum Co.

Drilling Alarms Soviets

With 1 year already shot, Russia's 5-year plan is bogged down by poor bits, shortages of materials, slow delivery

RUSSIA'S latest 5-year drilling plan is off to a faltering start. Production is holding its own, but the drilling program can't seem to get off ground in the Soviet's high-flying goal for 1956-60.

The U.S.S.R.'s Ministry of the Oil Industry is worried. It points out that "for the third straight year, total footage drilled remains practically unchanged—a situation which cannot be considered normal."

So the government is banking on its sixth 5-year plan to "liquidate the long-standing lag in drilling work." The ministry's magazine "Neftyanoye Khoziaistvo" (Oil Economy) puts the blame on:

... **Improper bits.**

... **Inadequate supplies** of casing, drill pipe, steel cable, bits, chemicals, and other materials and tools.

... **Slow delivery of spare parts** for turbodrills, engines, pumps, and cementing equipment.

... **Idle crews.**

Supply and equipment . . . The ministry is shooting for production of new-type bits using nickel-molybdenum and chrome-nickel-tungsten steels in 1957. Today's bits are not durable enough.

"In high-speed turbodrilling, specially designed bits with cutters made of wear-resistant steels are required, but the quality of steels and hard alloys used in reinforcing the cutting teeth has not changed in the past several years," the ministry said.

This forces crews to use improper bits to penetrate formations for which they are not intended.

Even if the right type of equipment were available, there's still the problem of inadequate supplies. During the first 10 months of 1956, suppliers failed to make scheduled deliveries of 24,662 tons of casing, 8,205 tons of drill pipe, 2,267 tons of steel cable, and cement and lumber.

Inefficiency . . . Lack of supplies means idle crews, and the problem was as bad in 1956 as it was in 1955. During the first 9 months of 1956, crew idleness accounted for what the Soviet magazine described as 18.1 per cent of the total drilling time.

The ministry also lashed out at inefficiency in delivery of spare parts for rigs, engines, pumps, and cementing equipment. In the first 9 months of 1956, Ukraine Oil Federation received only 25 per cent of its annual quota of spare parts.

The Grozny Oil Federation received no spare parts at all for several types of rigs and compressors during the first 5 months of the year.

Even when parts and equipment are available at supply bases there are long delivery delays. Many supply bases are located too far from wells.

The goal . . . The Soviet Union's record production in 1956 (more than 1,600,000 bbl. daily) was 18 per cent greater than the previous year. But drilling footage increased only 2.8 per cent in 2 years: 16,653,000 ft. in 1956, compared with 16,204,000 ft. in 1954.

Alongside U. S. gains in footage, the Russians' 2.8 per cent is small. The U. S. drilled 233,902,000 ft. in 1956, which is 6.7 per cent greater than in 1954. And in 1954, the U. S. industry increased its footage a whopping 10.1 per cent over the previous year.

Russia's goal for 1957 is 18,581,000 ft. And for the 1956-60 five-year period, the objective is an annual average of 26,000,000 ft.

But the government will have a hard time reaching that goal if it doesn't reverse the trend in rig activity. The average number of active rigs in Russia fell to 740 in 1956, compared with 1,220 rigs in 1954.

German Refinery Planned

Deutsche-Shell A.G., the West German affiliate of the Royal Dutch-Shell Group, will begin work on an 80,000-bbl. refinery between Cologne and Bonn this year.

H. Van Drimmelen, Deutsche-Shell chairman, said in Cologne last week the refinery will cost more than 265 million marks ($63,000,000). The 80,000-bbl. throughput is expected by 1960. The company has plans for expanding the refinery later to a possible 140,000 bbl. daily.

Crude will be supplied by a 700-mile, 30-in. (or larger) line from Marseilles to Rotterdam. It is to be built by a group of companies, including Shell *(The Oil and Gas Journal, July 16, 1956, page 76).*

The refinery will easily be West Germany's largest. It will eclipse the 68,000-bbl. plant now under construction by Esso A.G. (Jersey Standard) in the Cologne area. Esso plans to expand this refinery to more than 100,000 bbl. daily at a later date.

Brazil Monopoly Hit

Legislator planning bill to open oil to private citizens

THERE is still some feeling in Brazil that the government monopoly over the oil industry should be loosened to speed development.

Deputy Adolfo Gentil, a Brazilian legislator, said he plans to introduce a bill allowing private citizens to engage in exploration, production, transportation, and refining. The government would retain control of reserves.

The deputy reportedly feels private capital could boost crude production faster than is being done by the government organization, Petroleo Brasiliero S.A. (Petrobras). Under the modified law, participation would be limited to companies formed in Brazil by Brazilians.

The bill is expected to face a stiff fight. A similar bill was whipped in the Senate 2 years ago by a vote of 32 to 5.

Col. January Nunes, who heads Petrobras, said the government company can carry on its planned expansion from reinvested profits and government grants. The grants will total 13,500,000,000 cruzeiros by 1961. This amounts to $202,000,000 on the free-exchange rate, or $740,000,000 at the official rate.

Petrobras last year refined an average of 115,000 bbl. daily, or 55 per cent of domestic consumption. Crude production from Bahia fields rose from 7,000 bbl. daily in January to 24,700 bbl. daily in December.

Japanese Well Looks Good

The heavy rig bought by a private Japanese company last year apparently is getting results.

It has drilled a wildcat with signs of turning up a field larger than Yabase. Yabase produces 3,800 bbl. daily of Japan's 6,000-bbl. daily total.

Teikoku Oil Co. found sands exceptionally thick, for Japan, in its Oguchi 8. The sands were topped at 3,600 ft. Gas shows were encountered at 4,500 ft. A good oil show was found at 4,900 ft.

Sands of the same formation produce nearby from 1,050 ft. in the 60-year-old Nishiyama field. The company is drilling ahead in Oguchi 8 to a projected depth of 10,000 ft.

MUD FROM MANY NATIONS is loaded aboard Aramco barge in Persian Gulf. In buying from many countries, Aramco has whipped a troublesome foreign-currency problem.

Aramco Buys Where It Sells

DRILLING mud being used to sink Saudi Arabian wells these days has an international flavor—literally.

The mud is almost as international as the customers for Saudi oil. In fact, if consumers of the oil did not speak so many different tongues, there would be no need for the exotic mud recipes that have been whipped up by Arabian American Oil Co.'s mud engineers. It's all a matter of money, several different kinds.

Most companies operating outside the United States have currency problems of one kind or another. This is particularly true in the Middle East. It definitely is a problem for big Aramco.

The company is American. Naturally, it would like to sell its oil for dollars. But, when a dollar-short Frenchman wants to buy, he wants to pay in francs. The English prefer pounds. The Dutch like guilders; Germans, marks; Indians, rupees; and so on.

This would offer no real problem to Aramco if its parent American companies would take these foreign currencies as profits. But few American stockholders have much interest in francs, pounds, guilders, or rupees.

The big switch . . . In the past few years, as Aramco's nondollar income has increased, so has the problem. The only answer was to purchase supplies that could be used in the field with this foreign currency. Mud falls in this category.

Until the currency problem reached this stage, Aramco bought all its mud materials from the big, well-known suppliers in the United States in spite of the great shipping distances. The materials were standardized and drillers were familiar with the products and how they were used. All that has been changed.

Today, after 5 years of gradually developing a purchasing system, Aramco's mud materials and chemicals are bought almost entirely with nondollar currencies. Some specialty items and new products are still bought in the U. S., but aside from these, Aramco mud comes from some pretty exotic places.

The problems . . . It may sound simple, but it wasn't. First the company had to locate prospective suppliers. Before long, samples of offered materials began to dribble in to the Aramco laboratory in Dhahran. Then the dribble became a torrent. The lab couldn't possibly handle all of them. Some were of high quality, others absolutely unsuitable.

Some of the suppliers had no conception of the special requirements of the drilling industry. Manufacturers were usually eager to meet Aramco's requirements, but defining specific qualities was not easy.

During the first year hundreds of samples of bentonite, barites, phosphates, C.M.C. (carbomethyl cellulose), quebracho, and starch were evaluated. More than 30 different samples of C.M.C. were tested.

Then came the problem of correlating the test results with prices in francs, rupees, pounds sterling, and other currencies. The fact that Aramco's supplies of these different currencies fluctuate only added to the complications.

When the company thought everything was under control, the first purchase orders were issued. Shipments began to arrive and other problems came up. Some materials were of uniformly high quality. Others varied considerably in the same shipment.

All this meant clear-cut specifications. The Aramco laboratory started analyzing acceptable products and preparing the specifications in chemical and physical properties and various performance tests. A.P.I. test procedures were used.

Some materials, like barites, lend themselves to well-defined specifications. Calling for particle size, specific gravity, and freedom from soluble salts assures a desired quality. But, materials used to reduce organic water loss such as starch and C.M.C. give trouble. Two samples of C.M.C. with the same chemical characteristics may vary considerably in mud-stream performance. Work is still being done to standardize some of these test procedures.

With this type of problem pretty well licked, better supplies began to arrive. There was bentonite from Algeria, quebracho from India, caustic soda from Britain, starch from the Netherlands, C.M.C. from Germany, and barites from Greece.

Packaging woes . . . Because of all the attention given to quality, very little thought was given at first to packaging these mud chemicals. This was a mistake. It was an error that caused big losses on certain products.

The desert is not always hot and dry. Humidity ranges from 0 to 100 per cent. Rainfall is scanty, but it comes all at once in a few days of the winter months. Since mud chemicals are stored outdoors in large storage yards, this caused more problems.

This meant a new set of specifications, this time for packaging.

Airtight steel drums holding 100 lb. are now used for caustic soda, quebracho, and phosphates. Bentonites, barites, and starch are all packaged in valve-type paper bags holding 50 lb. The bags are made with six kraft plies, two of them bitumenized for waterproofing. They have protected materials stored outdoors for more than a year.

Aramco admits today it was a job, but the company thinks it was worth it. Suppliers now know exactly what the company wants and how to ship it. Aramco is now getting the materials it needs. And, the supply of francs, rupees, guilders, marks, and pounds sterling is not piling up. The mud sacks are.

Surinam Deal Made

Belt along Latin American coast let to Oklahoma firm

A BARTLESVILLE, Okla., company has acquired a concession over a large chunk of Surinam (Netherlands Guiana).

Marts Oil Co., through a subsidiary, Colmar Surinaame Olie Mij., N.V., obtained a 40-year concession over a belt ranging from 25 to 55 miles wide along the Atlantic Coast the entire length of the country. The offshore area is included.

Surinam is the middle of the three Guianas east of Venezuela.

Under Colmar's concession, the government would receive a sliding scale of payments plus 12½ per cent royalty. The company would pay 30 per cent on net profit on the first $2,700,000, and 40 per cent on the next $2,700,000. Profits over $5,400,000 would be split 50-50 with the government.

Losses in the first 5 years could be made up later in taxes. Colmar must start exploration work within a year and develop commercial production within 6 years.

Drilling is expected to begin around Nickerie in the northwest part of the country when the dry season begins in September. Surface work will begin immediately.

Past exploration work has been scant and unimpressive. Both Standard Oil Co. (N. J.), and Royal Dutch-Shell have had concession interests. A Jersey Standard company drilled what is believed to be the company's first and only wildcat in the early days of World War II. It was abandoned at 4,800 ft.

Rig in untested basin means . . .

. . . Stanvac to Spud in India

STANDARD-VACUUM OIL CO. will spud its first test of India's vast Bengal basin before the end of this month.

Stanvac has moved a National 55 rig and auxiliary equipment valued at $850,000 to India for the first test of its 10,000-sq.-mile exploratory concession.

The wildcat will be drilled about 3½ miles east of Burdwan, which is 30 miles northwest of Calcutta. It is projected to 10,000 ft. The rank wildcat is more than 300 miles from any previous drilling.

T. T. Conger, Stanvac's manager of production for Southeast Asia, says his company has already spent more than $2,500,000 on its preliminary exploratory work. He has placed the cost of the first well at an additional $1,500,000 *(The Oil and Gas Journal, September 17, 1956, page 137).*

Stanvac moves into India's oil picture at a time when it might be labeled the champion of private enterprise opposed to a government-owned operation. Jointly owned by Jersey Standard and Socony Mobil, the American company will find itself pitted against a socialistic operation in the eyes of the Indian public.

Government search . . . India's new government oil commission, headed by K. D. Malaviya, is engaged in its own campaign to find oil in India, aided by Communist Russian geologists and engineers. Malaviya makes no secret of his socialistic ideas when it comes to any question of private versus government enterprises. The Russian "experts" who have been called in to assist India have made repeated optimistic statements about finding oil in the country.

Conger, on the other hand, has been very cautious in all his statements for public consumption. The Stanvac manager says the Bengal basin has no obvious anticlinal formations. Stanvac's geophysical efforts have been directed at trying to locate the more elusive stratigraphic traps.

Mobile Homes for Turkish Pipeliners. The first 18 shiny new Spartan trailers of a 51-unit order are loaded aboard ship in New Orleans for shipment to Turkey. They were ordered from the Tulsa Spartan plant by Williams Brothers Co. to provide housing, office space, and general mobile camp facilities for the firm's crews in Turkey. The pipeline-construction company holds a contract for building pumping stations along NATO's Turkish products line.

Oficina Getting 30-In. Line

A 97-MILE, 30-in. pipeline being built in Eastern Venezuela will increase capacity from the Greater Oficina fields to Puerto La Cruz by 300,000 to 500,000 bbl. per day.

The leg now being completed jointly by Mene Grande Oil Co. and Creole Petroleum Corp. extends 22.4 miles from Anaco toward the Oficina pump station (see map). It will increase capacity of the existing system by 50,000 bbl. per day. Lack of pipe will delay the extension to the Puerto La Cruz terminal until the first quarter of next year. Fulgham Contracting Corp. is building the line.

Pipe will be laid on the surface and supported by pipe H-frames and concrete saddle blocks. It will be buried only through villages and at road crossings.

Existing system full . . . The trunk-line system, operated by Mene Grande, is already at full capacity of 530,000 bbl. per day.

The system consists of double 16-in. lines from the Oficina pump station to Anaco, a 26-in. line from Anaco to Puerto La Cruz, and 16-in. line from Anaco to Puerto La Cruz. A 16-in. line from Travieso parallels these lines, and is operated as part of the system, from a point 32 miles south of Puerto La Cruz.

The new line is being built to handle sharply increased production, particularly of viscous crudes of the Merey type.

Capacity will vary from 300,000 to 500,000 bbl. daily, depending upon the amount of the viscous crude to be moved.

The Oficina pump station, with total capacity of 272,000 bbl. per day, will pump most of the additional crude to be handled. However, some of the lateral lines north of this station will inject directly into the 30-in. trunk into designated batches.

Until the line is completed, the section now under construction will be looped with the existing system to boost present capacity. Later the 30-in. will be operated separately to segregate the heavy viscous crudes from Southern Oficina.

Crude disposition . . . Most of the Eastern Venezuela crude transported by this system is exported from Puerto La Cruz. Some 40,000 bbl. daily is refined by Venezuela Gulf Refining Co. and exported as products.

To handle the increased flow, Creole is building six 261,000-bbl. storage tanks at the terminal. A fifth loading berth is planned.

Second Tanker Due in Aqaba Gulf

THE second tanker hauling crude for Israel's nearly completed Elath-Beersheba pipeline was due to arrive this week.

The delivery will add to the stocks on hand to be pushed through the 135-mile, 8-in. line the moment it is pronounced ready to go. Private Beersheba sources expect the first regular pipeline shipment to reach the town the last week in April.

Pumping at Elath, apparently on a test basis, has already begun.

The flag and source of supply of the expected tanker was not immediately disclosed. Reports from the Middle East indicated the first tanker had picked up its crude in Iran.

Iran is not an Arab country. But the Iranian Government last week reportedly asked the 17 companies in the consortium not to make deliveries to Israel.

It also ordered its National Iranian Oil Co. not to make shipments to avoid harming Iran's "friends."

———*World* briefs

Dresser Industries, Inc., has entered the Italian oil equipment picture with the completion of the first Ideco Super 7-11 rig to be built in the country. Nuovo-Pignone, the Dresser licensee in Italy, plans to build 12 of the rigs. The government agency, Ente Nazionale Idrocarburi, which has an interest in Nuovo-Pignone, will be a major customer for the equipment.

Shell BP Development Co. of Nigeria, Ltd., has contracted with a Dutch firm for two rigs to be used in Nigeria. Netherlands Drilling Co. (Drilvo), The Hague, will operate the rigs.

Two of Pan American Petroleum Corp.'s Latin American subsidiaries have changed their names. Jamaican Stanolind becomes Pan Jamaican Oil Co., and Venezuelan Stanolind becomes Pan Venezuelan Oil Co. Cuban Stanolind Oil Co. remains the same. The changes are in line with the parent company's switch from Stanolind to Pan American.

Lion Oil Co., a division of Monsanto Chemical Co., has entered Sicily. It obtained a 45 per cent interest in concessions covering 780,000 acres on the island held by Italy's Sta. Edison. Monsanto is associated with Edison in chemical production in Italy.

Jupiter Oils, Ltd., New York, has acquired drilling rights on 130,000 acres in Pinar Del Rio and Matanzas provinces in Cuba. Golden Saturn Oil & Gas, Ltd., a Canadian company, holds the concessions.

BP-Shell Development Co. of Zanzibar, Ltd., has abandoned its deep test on Zanzibar at 14,281 ft. as a dry hole. An 11,051-ft. dry hole was drilled nearby Mafia Island early last year. Location for the next test in the East African operation has not yet been picked.

Williams Brothers Co. of Tulsa is setting up an engineering office in Caracas to serve operating companies in Venezuela. Headed by Arnold J. Carrico, the office will handle everything from feasibility studies through complete engineering designs for pipelines and allied facilities. It will operate under Williams Brothers Sudamericano, which already has a construction office in Caracas.

Through Hell and High Water

BROWN & ROOT HAS LAID MORE THAN 850 MILES OF MARINE PIPELINE!

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CABLE ADDRESS—BROWNBILT

OUTSIDE Submerged arc applied to making an outside weld. Slag is removed by tool and unfused flux is picked up by vacuum hose. Operator (left) only guides the head. Controls are preset for amperage, voltage, and rotation speed.

NOW

Completely Mechanized Pipeline Welding

INSIDE Operator for making inside weld lies on a couch mounted on a specially designed gantry boom, holding welding unit, which quickly slides into the pipe to the welding position.

It's simple, practical, low cost, successful . . . and it's a natural for winter operation

by Paul Reed
Pipeline Editor

IN facing the problem of automatic pipeline welding, H. C. Price Co. has developed the first completely mechanized welding procedure, practicable for yard operation under extremes of atmospheric temperature previously considered prohibitive for welding.

From a pipeline standpoint the Price unit, named "Price-O-Matic-Welder," is completely automatic. Here are some of the unusual features of this technique:

- There is no preheating. This omission has been surprising because preheating was previously considered necessary for welding at very low temperatures.
- Another omission contrary to previous practice, is the elimination of a stringer bead and hot pass preparatory to submerged arc welding.
- For the first time in pipeline welding practice, an operator runs a bead inside the pipe (following the running of the outside beads).
- The beveled end of the pipe is ground to make a shorter, thicker land.
- Pipe is butted together tight during lineup without spacing.

Since January 14, the new submerged arc-welding procedure has been operating in Manitoba at a portable double-jointing yard for the 99-mile section (34-in. diameter ⅜-in.-wall pipe) contracted by Price Poole of Canada, Inc., for the Trans-Canada Pipe Lines, Ltd., system being built from Alberta to Montreal.

Atmospheric temperatures have been as low as —44° F. Common,

PIPE ENDS are ground to form a ¼-in. land by special electric-driven disk grinders.

daily temperatures have been around zero. Qualification tests were made January 9 with temperature around —24° F.

The consistency of high-quality welding production in completely outdoor operation has been impressively demonstrated.

Average output is 70 welds per day. The day the author visited the plant, 80 welds were made. Some days output has been up to 90 welds. The plant operates with a 10-hour day, 7 days a week.

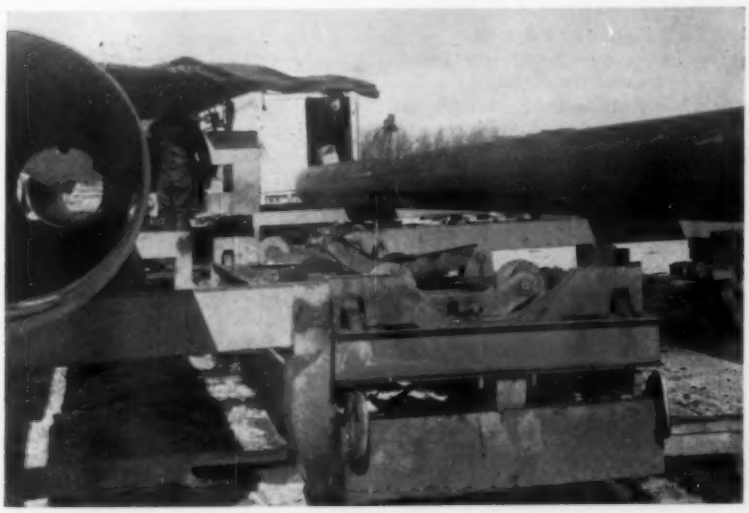
The developers recognized that the characteristics of submerged arc welding are peculiarly adapted to extreme cold-weather conditions. It is an arc-welding process using intense heat due to high current density giving deep penetration with high-welding speeds.

Molten and granular layers of flux act as good insulators concentrating intense heat in a small welding area, causing the base metal and the electrode to become thoroughly fused. Basic requirements in the procedure are determination of joint design, welding speed, and heat.

Now that impressive results have been produced in extreme cold weather, it becomes apparent that double jointing during a Canadian winter could not be practical by any other known method. Because of its versatility the procedure also has promise of suitability to hottest weather conditions.

H. C. Price—a pipeline contractor educated as a metallurgist—has been persistently seeking a solution of the problem of automatic pipeline welding during the last 30 years. Price gives credit to Barney Elliott as the developer of the new procedure in collaboration with Don Barchus, both of the Price organization.

This article was prepared with assistance of information from Kenneth E. Britain, project manager, Carl C. Whitaker, construction supervisor, and Cecil Flippin, welding inspector, all of Trans-Canada Pipe Lines, Ltd., and from Harold C. Price, Barney Elliott, and Don Barchus of H. C. Price Co., during visits to the Price welding plant at Oak River and the Trans-Canada office at Winnipeg.



THE SPECIAL hydraulically operated rack equipped for horizontal lineup, rotation, and kickoff is about to receive two 40-ft. joints (now rolling to the welding position for running outside beads). An 80-ft. joint with sealer and cap beads on the girth seam is rolling away toward rack for making the inside weld.

Weld quality . . . The excellent quality of the welds can be observed in the nick-break tests which show the grain of the weld to be finer than the grain of base metal of the pipe. Quality is consistent throughout the weld. Outstanding features of the Price weld are threefold: Maximum ductility, superior tensile quality, and a definite approach to 100 per cent quality when X-rayed.

The fusion zone consists of 80 per cent base metal and 20 per cent filler metal. As a result the weld reflects the properties and composition of the base metal to a larger extent than other processes in which only small quantities of base metal are fused with added filler metal.

Welds made by the Price automatic method are far above the requirements of the A.P.I.-A.G.A. code.

The severe 180° side-bend test has been applied to straps more than 30 times without a failure. Superior weld ductility has been demonstrated by twisting a strap eight times. This spectacular test has been made repeatedly. Most manual welding would fail under both tests because of atmospheric intrusion during welding.

Experience shows that visual inspection can quickly determine whether welds are good or bad.

At the beginning of this automatic-welding procedure, half of the welds were cut out by the Price technologists to examine weld quality in order to insure continuity of satisfactory production.

Joint preparation . . . The 34-in.-diameter pipe with ⅜-in. wall (A.P.I.

WELDING UNIT inside the pipe at extreme left during early testing of Priceweld watched by Barney Elliott, development project foreman, R. K. Shivel, general construction superintendent, Roy Burgess, administrative manager, and Harold C. Price, president, H. C. Price Co.

5LX-52—72,000 psi. tensile), is supplied in 40-ft. joints with the usual 30° bevel and $\frac{1}{16}$-in. land. At the Price yard the first operation is to grind the bevel to form a ¼-in. land, amounting to two-thirds of the wall thickness. This results in a groove only $\frac{1}{16}$-in. wide at the outside surface of the pipe.

A smaller welding groove than usual is sufficient because of the deep penetration of the submerged arc weld.

Pipe ends are ground by two men, each of whom swings an electric-motor-driven Howard bevel grinder, rotating abrasive disks. This equipment is similar to that used for smoothing rough torch-cut pipe bevels. Thirty disks grind about 75 welds.

Lineup and tacking . . . In lining up with a Crose hydraulic lineup clamp, the pipe ends are butted by jamming together. Elimination of the usual $\frac{1}{16}$-in. spacing between joints is therefore another feature of the Price method.

In lineup, the pipe is hit with only two or three sledge-hammer blows, only to agitate the internal lineup clamp so that it will press more quickly and evenly against the pipe. The blows are not for the purpose of beating out the high-lows.

Thin cast-iron straps for backup are welded to the surfaces of parts of the lineup clamp in contact with the pipe.

The only manual welding in the procedure is a 2-in. tack weld made with a stringer bead applied by a manual electric-arc welder. The tack is just to insure against slipping while the pipe is rotated. Improvements in grinding and lineup may lead to complete elimination of any tacking within a few months.

In the early part of operating with the Price automatic welding procedure, tack welds were full welds. But now tacking is just a 2-in. stringer bead.

Welding operations . . . The outside beads are run at the rate of 52 in. per minute. The inside bead is run at the rate of 40 in. per minute. In some preliminary experimenting, tests were made by welding as fast as 70 in. per minute.

The two outside passes are made in 7 minutes.

The inside weld is made in 3 minutes. The complete inside operation, including going in and out and welding, is a little more than 4 minutes.

The first outside weld—the sealer bead—is necessarily of limited penetration. The inside bead, which is actually easier to make than the outside beads, is a weld of very deep penetration which contributes a major part to the strength of the entire welded joint.

Current is 300 to 600 amp. at 32 to 35 volts.

The sealer bead is ¼ in. wide; the cap bead is ½ in. to $\frac{5}{8}$ in. These narrow beads are more effective than wider ones. The welded area can be observed to be red hot for a distance of a foot, which indicates the extent of heat penetration during welding.

Furthermore, the penetration of heat into sizable pipe areas adjacent to the weld are believed to facilitate ironing out the high-lows. Therefore, there is not the tendency for egged pipe to spring back after welding as it has been seen to do on some other cold-weather welding jobs.

Interpass temperature between running the sealer and cap bead is 500° F.

The first outside bead (sealer) is usually made with 300 amp.; the second outside bead (cap) and the inside bead are both made with 450 amp. Amperage for these last two may vary from 400 to 550. The only thing the operators do is to guide the welding on the seam. All welding controls are preset by the technologists for amperage, voltage, and rotation speed of the pipe. Rate of wire feed is governed by amperage.

The operator on a gantry boom inside the pipe operates by controls the movement of the boom, while running in and out of the pipe, and the rotation of the pipe as well as the welding.

His helper on the outside only kicks the pipe out on the rack for rotating and attaches the ground wire.

The gantry boom, carrying operator and welding equipment into the pipe, is operated by an electric drill motor through a gear reducer. Movement of the boom is manipulated by means of a heavy roller chain, welded to the boom, and a sprocket.

Equipment and material consist principally of welding head, electrical equipment, granular flux, electrode wire, and accessories such as the control board and electrode reel.

The welding head progressively deposits flux along the seam to be welded, feeds the wire electrode into the welding groove, and transmits current to the electrode.

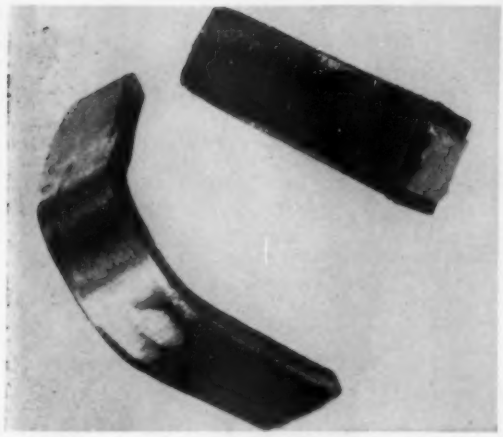
Flux from a hopper and wire electrode from a coil are fed into the head.

The welding head is a modified Lincoln ML 2 which provides operating characteristics similar to those of a fully automatic head. Therefore, it is referred to as a semifull automatic head. It is of single-tube type. Modifications include a flux gun of special design having a gooseneck. The larger flux-holding capacity improves operating efficiency. The flux cone has a larger orifice and special shutoff valve. Wire is fed without magnetizing effect and without restriction.

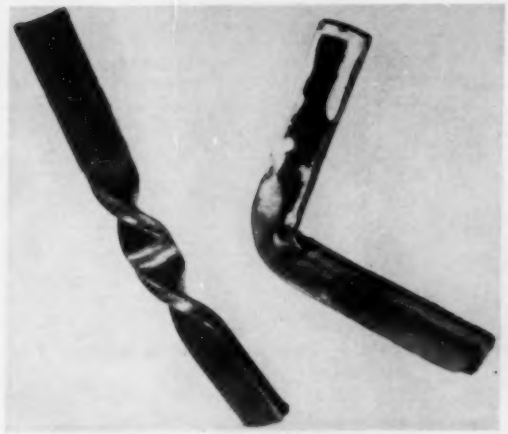
The electrode is L 60 bare wire, 3/64-in. diameter. In early tests, 3/32-in. wire was found to be too large.

Black granular material known as No. 781 agglomerated flux covers the hot weld metal. Flux for submerged arc welding is granulated fusible material including silicates, ferral deoxidizers, and other ingredients. Flux cleanses by absorbing impurities from molten weld metal. When it melts and floats on the molten metal, it shields it against atmospheric contamination.

During the weld operation, fluid



STRAPS subjected to conventional tests: (left) 180° guided root bend test; (right) nick-break test showing high weld quality.



UNCONVENTIONAL welding tests demonstrate unusual weld strength: (left) twisting; (right) horizontal side-bend test.

flux is displaced by molten weld metal while the weld is formed. The molten flux forms a protecting blanket over the molten filler metal. Both the molten filler metal and the molten flux solidify on cooling under the unfused flux. Fused flux floating to the top of the deposited metal, solidifies as a brittle slag which is readily removed from the weld surface. The upper part of the flux does not become molten and continues unchanged in granular form so that it is easily picked up by a vacuum hose for reuse.

Welding operations are served by three 600-amp. Lincoln motor-driven welding generators powered by a 75-kw. diesel-driven generator. Two of the 600-amp. welding generators are in regular use. The third is a spare.

There are only three men at the plant doing welding. Two of these are submerged arc-welding operators who only guide the welding operations and do not adjust controls. They are not qualified as manual welders. The third man is a manual welder who only makes the 2-in. stringer-bead tack weld.

In warm weather, the entire crew at the Price welding yard need only be 12 men including the operators and welder. In cold weather, the crew may be as large as 19, since 3 to 7 extra men are needed for snow removal.

Close, constant, technical supervision is essential for maintaining uniformly high weld quality.

Rotating and conveying . . . Of vital importance in pipe handling for highest efficiency is the pipe-handling equipment. The Crose-Curran double-jointing racks have electric-powered hydraulically operated pipe-handling devices for horizontal movement during lineup, rotation while welding, and kickout for rolling to the next rack. These have been designed to save valuable seconds needed for getting the highest yard output. Rigidity of the pipe during lineup and rotation of pipe for making the first bead is essential for successful submerged arc welding. Pipe rests on rubber surfaced rollers automatically driven to turn the pipe at the desired speed.

Welding and conveying equipment can be moved on two trucks and set up at a new location, 20 to 30 miles away, in a day.

Hauling . . . Pipe is handled by Dunn Brothers, the stringing contractors, for movements in the yard to and from the Price welding operators. For the yard work, Dunn Brothers have two side-boom tractors and a crane and also a bulldozer for removing snow.

Stringing trucks carry three 80-ft.-length double joints from the Price plant to the right-of-way.

Double jointing role . . . The important part played by the double-jointing yard in Price-Poole operations is indicated by the fact that all of the pipe for the Price-Poole spread is being double jointed except for a few short joints.

THE AUTHOR, left, and Cecil Flippin, welding inspector, Trans-Canada Pipe Lines, Ltd., at Price-Poole's Oak River, Man., welding yard.

By making nearly half the welds for the 99-mile job at a yard plant, Price-Poole not only gets the advantage of the lower plant-welding costs but also has the chance to get an even larger gain from faster progress of the spread.

Winter months which have been considered impossible for pipeline work have been turned into a profitable opportunity by the Price technique.

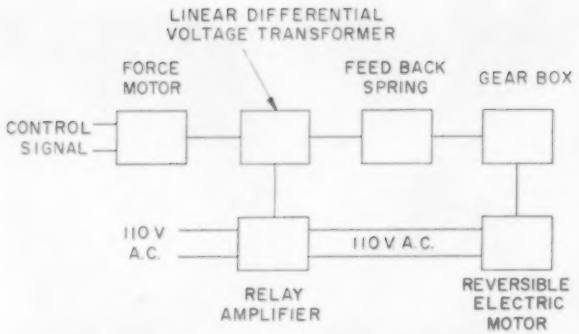
It appears from rough estimates that the costs of making welds at such a yard plant as that of Price-Poole would be less than it would be in the field. There, welding costs would entail expense of 25 to 30 welders with their helpers, welding machines, and tractors.

In comparison the yard plant has two operators and a tack welder plus 12 to 16 unskilled laborers and plus technological supervision. Material costs for wire electrode and flux amount to only 30 cents plus approximately $1.72 for abrasive disks for grinding per weld.

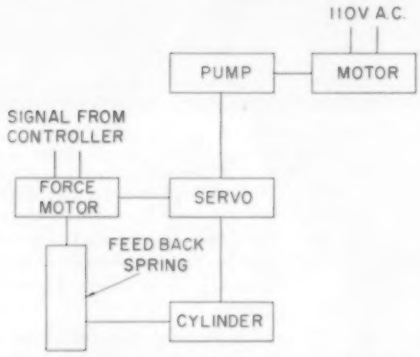
Although the Price technique appears to be advanced beyond other double-jointing methods, improvements are being planned for early increased efficiency.

The Price procedure, for which a patent has been applied, is an original development aimed primarily at pipeline double jointing.

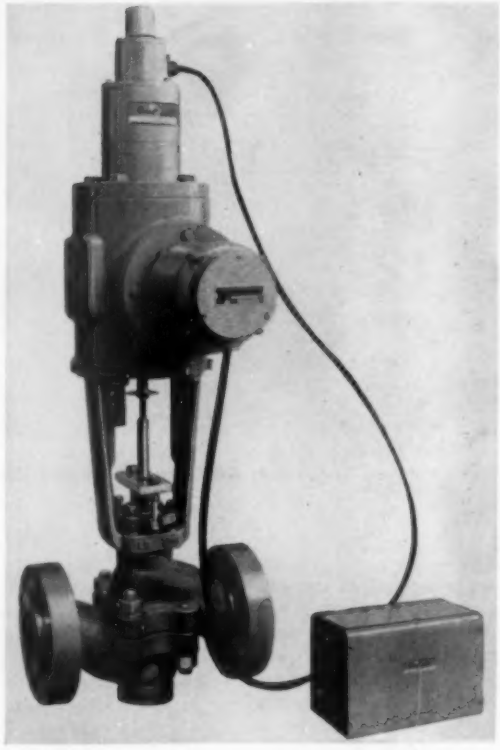
The Price technique promises to revolutionize the procedure for laying big-inch pipe in areas that are favorable for double jointing. **End.**



BLOCK DIAGRAM of geared electric motor operator. Fig. 1.



BLOCK DIAGRAM of simple electrohydraulic operator. Fig. 3.



GEARED electric-motor-operated valve. Fig. 2.

A Look at Electrical Valve Operators

The final control element has been hard to convert, but several electric operators have appeared and there'll be more in future

by Glen F. Brockett

RECENT developments in the instrument industry clearly reveal a trend from pneumatics to electronics. This trend toward electrical instrumentation has not been revolutionary, but it is persistent and significant of things to come. Major petroleum and chemical companies have either made a trial installation or investigated the advantages of doing so. Most of these trial installations apparently have had a considerable measure of success, although certain weaknesses in available components have inevitably appeared. Rapid strides are now being made in the development and improvement of components and the future of electrical or electronic instrumentation seems assured.

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● People who champion the cause of electronic instrumentation claim that electronic devices are inherently sensitive with small dead bands, lend themselves ideally to miniaturization, make long-distance transmission practical, and are almost a "must" for use with data handling and computer systems.

● On the other hand, further development in the direction of lower costs, simplicity of construction, ease of maintenance, and dependability, is urgently needed. Lack of a standard signal range is also a deterrent to the industry at the present time.

● Of all the elements in the control loop, the control valve or final control element has been the most difficult to convert from pneumatic to electrical operation. In spite of design problems, however, several electrically powered self-contained operators for process control valves have appeared on the market and undoubtedly there will be more in the future.

Present Status

Some of the various types of electrical valve operators now on the market are reviewed here. Some of the fundamental design problems involved are also considered. Conclusions reached are:

1. It is possible to produce a self-contained modulating electrically powered operator that will perform as

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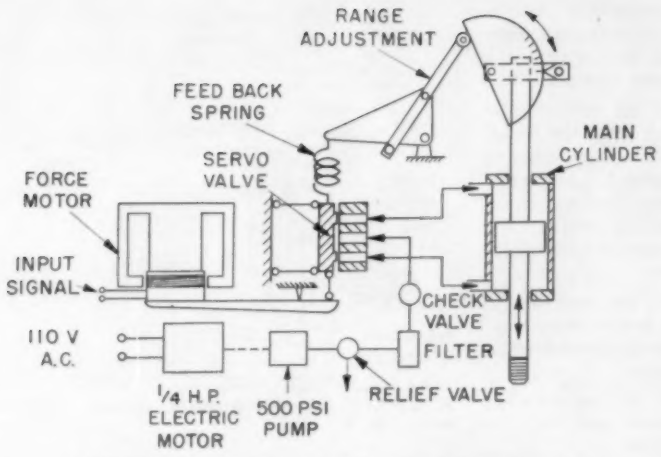
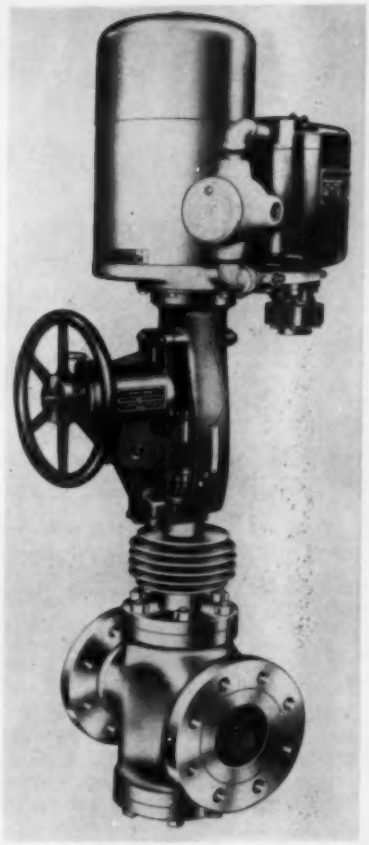


SCHEMATIC of simple electrohydraulic operator. Fig. 4.



ELECTROHYDRAULIC operator mounted on valve with manual operator. Fig. 5.

well as or better than pneumatic operators. These operators can be made to meet all normal thrust and speed requirements, to position with a very high order of accuracy, and to have excellent frequency response. In addition, if a hydraulic piston is used, a stability of positioning is achieved that overcomes a serious weakness present in all pneumatic diaphragm or piston operators. The pneumatic diaphragm or piston is a resilient assembly that moves in response to dynamic forces transmitted from the inner valve or plug by the valve stem. On the other hand, the hydraulic piston is positioned by a noncompressible fluid that dampens vibration and prevents jumping of the inner valve with resultant rough control and wear on the valve components.

2. In its present stage of development, the electrically powered operator is not able to compete economically with the simple spring-and-diaphragm pneumatic operator. A pneumatic operator for a 2 or 3-in. valve, with a pneumatic positioner, has a price tag of about $160. Without the positioner it costs only about $70. Therefore, the electric operator priced at $500 and up is going to be hard to justify from a dollars-and-cents viewpoint. This is particularly true in the process plant that already has an adequate instrument air system and where plant additions or modifications only are being considered. Even in a new plant where electrical instrumentation is being used, the complete air system for the operation of control valves only could probably be justified if 100 or more valves were involved.

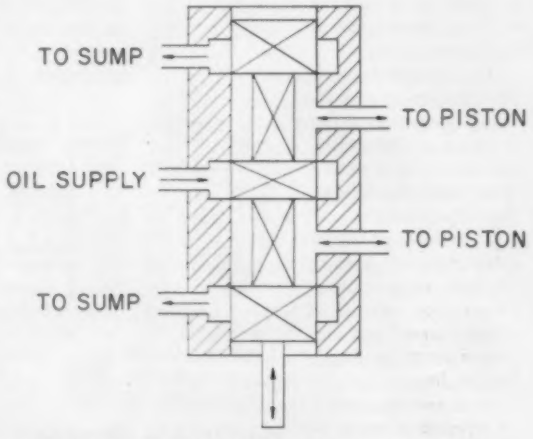
3. A satisfactory installation can be made using electrical or electronic instruments and pneumatically powered control valves. Electropneumatic transducers for converting the control signal to a pneumatic one are simple and not too costly. They are currently available from several manufacturers.

4. Also, electropneumatic valve positioners that operate from an electrical signal, but have a pneumatic output to a diaphragm motor, are available and have been used rather extensively. This type of positioner used in conjunction with a conventional diaphragm motor is a great deal less expensive than any equivalent all-electrically powered operator yet conceived, and will require less maintenance. Its ultimate performance may not be as good, but it is satisfactory for most process applications.

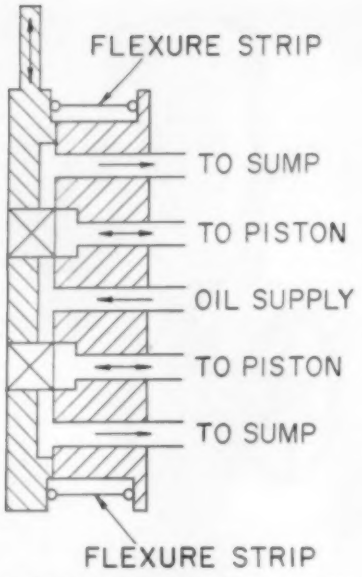
5. On the other hand, there are applications involving long transmission lines and remotely located control valves where the greater expense of an all-electric valve may be justified. Examples of such applications would be automatic transfer systems on tank farms, or pipeline controls. In extremely cold climates where air lines are susceptible to freezing, electrical operators may be easier to justify. Also it is probable that many of the processes of the future will be so complex and so demanding in instrument performance that only the most advanced electrical valve operators can measure up to the requirements. It is in such a plant that electrical instrumentation all the way to the final control element, will come into its own. In the meantime, it behooves the instrument and valve designer to develop and improve their products so that our industry will not be found wanting when the need is at hand.

What's Required

Development of a satisfactory modulating electrical control valve operator is difficult fundamentally, because of the large-scale intermittent power requirements. All of the methods so far discovered for converting



SPOOL-TYPE four-way hydraulic servovalve. Fig. 6.



SLIDING-PLATE-TYPE four-way servo-valve. Fig. 7.

electrical energy into sufficient power to operate even a medium-sized control valve incorporate a rotating electric motor. The torsional force thus produced must be converted into a reciprocating motion for positioning the plunger of a control valve. And this motion must be controlled.

Control-valve designers have not been entirely unaware of the fact that the present-day sliding-stem body assembly might not be the most ideally suited to electrical operation. However, the development of a completely new valve assembly is such a lengthy and costly research project that manufacturers have adopted the obvious expedient of designing an electrical operator that can be adapted to available valves. Probably a completely new valve will be evolved some time in the future.

To compete with pneumatic control-valve operators in the process industries, electrical operators must meet the following requirements:

1. Be completely self-contained, requiring no inputs other than the electrical control signal and a.c. power from the distribution line.

2. Have the ability to operate directly in conjunction with all commercially available process controllers with their varying output signals.

3. Be able to perform from the standpoint of positioning accuracy, available thrust, and speed, at least as well as the pneumatic counterpart.

4. Be available in an explosionproof case for hazardous locations.

5. Be reasonably simple and easy to service.

6. Be rugged enough to withstand the abuse it is sure to get in a large industrial process plant.

7. Be reliable enough to give trouble-free operation over a period of years.

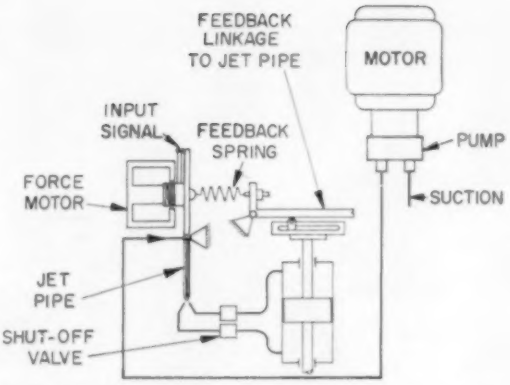
8. And last, but not least, be priced within reason.

Of these requirements, simplicity, ruggedness, reliability, and low cost are the most difficult to achieve.

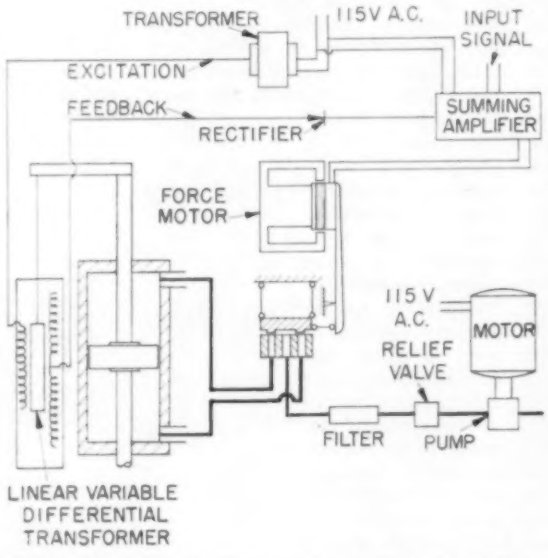
Control-Valve Operators

An electrical valve operator incorporating an electric motor, driving the valve stem through a gear box, with appropriate controls, would seem to be the most direct approach to our problem. In this system, the power input would be employed directly, without conversion to another operating medium. This would apparently result in a savings in conversion component costs, conversion inefficiencies, and complexity.

But a comprehensive analysis of the possibilities with this type of actuator brings out some fundamental weaknesses. The maximum torque that can be exerted by the rotor of an electromagnetic machine is a function of the strength of the magnetic field which is created. If we consider even the most desirable of modern magnetic materials, we find that we can achieve a maximum effective "magnetic pressure" of the order of 50 psi. On the other hand, if we are to get good frequency response and speed of operation, the inertia of the rotor must be

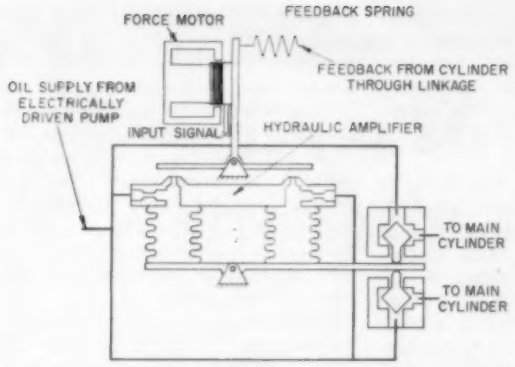


SCHEMATIC of electrohydraulic operator with jet pipe servo. Fig. 8.

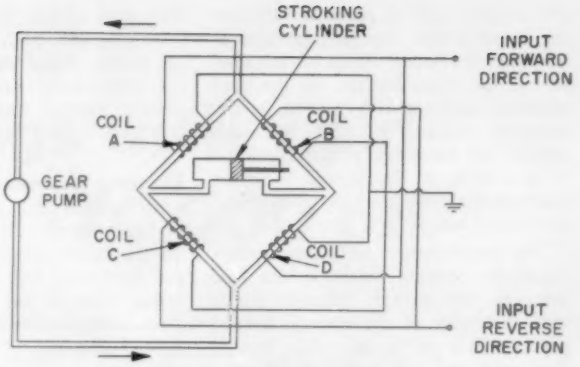


SCHEMATIC of electrohydraulic operator with electric amplifier. Fig. 9.

ELECTROHYDRAULIC - operated control valve. Fig. 10.



SCHEMATIC of electrohydraulic operator with hydraulic amplifier. Fig. 11.



MAGNETIC-PARTICLE hydraulic circuit. Fig. 12.

kept very low. It immediately becomes obvious that a combination of high stem thrusts and rapid response in a device of this type will be very difficult to accomplish.

Backlash . . . In addition to the fundamental disadvantage in the torque-to-inertia ratio, we are also faced with the necessity of providing satisfactory gearing between the motor and valve stem. Gears of any kind are undesirable from the standpoint of backlash that may develop from normal wear or from the effect of vibrational forces that are often generated in the valve body itself.

Direct-drive operators . . . In spite of these inherent obstacles, direct drive, modulating operators have been designed and are available to process instrument men. A block diagram showing the essential elements in one of the better ones is shown in Fig. 1, and Fig. 2 shows its external appearance.

In this arrangement, the controller signal is fed to a small force motor or "voice coil" which is mechanically linked to the core of a linear differential voltage transformer. This latter serves as a null-type motion detector. The current produced by the motion detector is fed to a relay amplifier to operate one of two relays. The relays apply 110-volt a.c. currents to the forward or reverse winding of a low-inertia electric motor. The motor drives the valve stem through a linear-motion gear box. A force-balance type of feedback is accomplished by a spring attached to the valve stem which resets the core of the linear differential voltage transformer and the force motor.

This operator is relatively small and compact and is advertised to deliver a maximum thrust of 500 lb. at a stroking speed of 1 in. in 15 seconds. This is probably about the optimum performance that could be expected from an operator of this type. It is doubtful if it could be made powerful enough to operate large valves against high-pressure drops, without some form of electrical braking on the motor. This would be complex and expensive.

Hydraulic system . . . As an alternate to driving the valve directly by an electric motor and gear box, most designers have turned to the use of an intermediate self-contained, hydraulic transmission system. In this system in its simplest form (Fig. 3), an electrical-motor-driven pump provides a continuous source of high-pressure fluid for positioning the main operating piston, which is directly attached to the valve stem. The flow of oil to the piston is regulated by a hydraulic servovalve which is positioned by a force motor in response to changes in the signal from the controller. As in the geared controller described above, a force-balance type of feedback is accomplished through a spring which is loaded by movement of the main valve stem to reset the force motor and the servo.

A commercial adaptation of the design is shown schematically in Fig. 4 and externally in Fig. 5. It is powered by 110-volt a.c., ¼-hp. motor which drives the rotary gear pump. The pump delivers oil to the hydraulic system at 500 psi. The hydraulic system consists of a relief valve, a filter, a check valve, a servovalve and a double-acting power cylinder. The servovalve is positioned by a force motor that is, in turn, powered by the instrument signal. Feedback and range adjustment are provided in the form of a system of linkages and a spring between the main cylinder shaft and the movable member of the servovalve. This model is advertised to deliver a maximum thrust of 1,250 lb., with a stroking speed of 1 in. in 3 seconds. By using a larger power piston, more thrust may be obtained, but the speed will be proportionately decreased.

Servovalve problems . . . All of the components in a design of this general plan are well known and are readily available in commercial forms. The servovalve, however, has proved to be a stumbling block to many designers. Servovalve, or four-way pilot valves, of a sliding spool design, illustrated schematically in Fig. 6, have been used for many years in aircraft controls, gun-pointing mechanisms, etc., and are available from several manufacturers. They have a very high power gain and excellent frequency response, but they are extremely sensitive to dirt particles in the hydraulic fluid, and their cost is prohibitive for this application due to the extremely close manufacturing tolerances required.

M.I.T. design . . . The design represented in Fig. 4 and shown enlarged in Fig. 7, was developed by Lee and Shearer at Massachusetts Institute of Technology and is described in A.S.M.E. Paper No. 54-A-196. It is produced by drilling holes simultaneously through metal plates that slide against each other in the final assembly. Its advantage is that it has no extremely difficult machining tolerances. The movable plate is supported by two flexure strips. Adaptations of this design are being used by at least two electrohydraulic operator manufacturers.

Jet-pipe system . . . Another manufacturer offers a similar system to the one just discussed, except with a jet-pipe type of servo. It is shown schematically in Fig. 8. In this comparatively simple system, the force motor positions the jet pipe or nozzle to discharge into one or the other of two closely adjacent receiving orifices, which are directly connected to the actuating cylinder. The secret of suc-

cess of this type of servo is the high degree to which the jet-type system has been developed. With oil pumped at 160 psi. from the jet, 90 per cent pressure recovery is achieved in the receiving orifices. As in the previous model, the feedback is accomplished by a system of levers and a spring between the main operating shaft and the force motor.

The manufacturer of this unit offers automatic shutoff valves in the lead lines to the power cylinder which lock the valve in place upon loss of power. This is a desirable feature that could be added to any operator using a hydraulic system and a piston.

This model is advertised to produce a maximum stem thrust of 600 lb. with a stem speed of 1 in. in 2 seconds at no load and 1 in. in 5 seconds at 600-lb. load. This operator is not as powerful or as sensitive as some on the market, and its frequency response is not as good, but it probably would be quite dependable as a result of its simplicity and large, wide-open oil passages.

Signal not standard . . . In the designs so far considered, we have used the power from the controller signal to drive a force motor directly. This controller signal has not been standardized, and as yet no two electronic - process control instrument manufacturers use the same signal. The three manufacturers who offer the most complete line of process instruments at this time, use signals of 0.5 to 5 ma., 4 to 8 ma., and 0 to 30 ma. The 0 to 30 range is used by an English company. From the standpoint of the valve manufacturer, it is desirable to use as high a signal range as possible. It is not practical to design a force motor that will produce more than a few ounces of force with 4 or 4½ ma. input. Many designers feel that this is not adequate to provide the dependability in the operation of the servovalve that is prerequisite in an industrial-quality operator.

Amplifier Systems

The alternative to more power in the signal is amplification of some kind. The most obvious would be an electrical amplifier in the signal line. By the addition of such a "black box," the power to the force motor may be increased until several pounds of force are available to operate the servovalve. The use of an electric amplifier also makes it possible to provide electrical feedback from a linear differential transformer attached to the main valve shaft. The amplifier may be a vacuum tube, transistor, or magnet type. The steady-state magnetic or transistor types are, of course, most desirable, but they are not readily available from commercial sources and are quite expensive.

Electrical feedback . . . Fig. 9 shows schematically an operator available on the market today that incorporates an electrical amplifier with electrical feedback. Fig. 10 shows an external view of this operator mounted on a control valve. This is a null-type system and when it is in balance, the force motor and servovalve are centered and no oil is flowing to the main cylinder. The piston is stationary and the error voltage is zero. When a signal change from the controller is transmitted to the summing amplifier, it is compared to the feedback signal from the linear differential transformer. The difference or error voltage between the control signal and the feedback signal is amplified and transmitted to the force motor which moves the servovalve. This permits a flow of hydraulic fluid to move the main piston and displace the core of the linear differential transformer. The feedback signal thus generated is transmitted to the summing amplifier, and the force motor and servo are reset to center.

This operator has good stability, excellent frequency response, precise positioning ability, and speed and power that are a function of the pump capacity and piston size. However, it is too expensive and complex to be practical for use on the average process-control-valve application.

Hydraulic Amplifier

The use of a hydraulic amplifier between the force motor and the servovalve is also a possibility that should be considered. Much less force would be required to operate a hydraulic pilot or amplifier than would be required for the main servovalve. A system such as this would be less costly than the electrical amplifier type and would be particularly attractive if a somewhat higher control signal could be used to operate a more rugged force motor.

Fig. 11 shows schematically one of many possible variations of this principle. As shown, the main servo consists of two branch lines from the oil pump feeding two three-way valves operated by a flapper between them. The flapper is positioned by a hydraulic amplifier which consists of two bellows with two nozzles and restrictions in the oil lines leading to them. The amplifier nozzles are fixed and flow from them is controlled by a T-shaped lever. The lever is positioned by the force motor. Feedback and range adjustment are acomplished, as in other models, by a system of levers and a spring between the main shaft and the force motor. This is a null system with no parts difficult to manufacture. The frequency response would probably not be as good as with an electrical amplifier, but it might be good enough for most applications and it would be simpler and less costly.

"Failing safe" . . . In the electrohydraulic operators presently available, and so far discussed, four-way servos and double-acting pistons have been used. These have a fundamental weakness in not "failing safe." Upon loss of power, they will go open or closed, depending upon the flow reactions on the inner valve. As already mentioned, one manufacturer has overcome this difficulty by installing automatic shutoff valves in the oil lines to the piston which close upon loss of oil pressure. This temporarily locks the valve in operating position, which is perhaps the most desirable eventuality, although it does not serve as an automatic warning that something is wrong.

It would also be possible to use a single-acting cylinder with spring return controlled through a three-way servo. This construction would duplicate the fail-safe advantage of the diaphragm-and-spring pneumatic operator, but would also have many of its shortcomings. This seems to be another case of not being able to have your cake and eat it too.

More sizes needed . . . Manufacturers who have already entered the electrical-control-valve-operator field have to date each offered but one size of operator for all sizes of control valves. This is undoubtedly an expedient adopted to get something on the market quickly, for surely a range of at least three sizes will be ultimately required. An operator suitable for a 12 or 16-in. valve would be somewhat oversized for a 1-in. valve. This lack of an adequate size range presents a serious problem to anyone currently interested in equipping an entire process plant with electrically operated instruments and valves.

No doubt there are many new and clever ideas for electrical valve operators on drawing boards and in laboratories at the present time, and it is not unreasonable to assume that some of these will prove better than any yet offered. Rapid and far-reaching progress is certainly to be expected in an industry as young and important as this one. **End.**

NEEDED—

Casing strings with yield strengths to 170,000 psi.

Wells in the 20,000-ft. range severely tax casing, drill pipe, and tubing of the strongest present A.P.I. grades. To meet this problem, grades with strengths as high as 140,000 and 170,000 psi. are now being developed. By a process called "quench and temper," high strengths are obtained with an increase in ductility and toughness.

by J. J. Lenker and H. W. Heckathorne

WELL depths are increasing yearly. At the same time, higher pressure gradients are faced more often. These factors suggest that more oil-country tubular goods of high-strength properties will be required. Designs of casing strings, based upon depths to 25,000 ft., indicate that yield strengths as high as 170,000 psi. may be needed to develop such wells. Strength levels of this order may be achieved and reasonable ductility may be maintained by using the quench-and-temper method of heat treating. Moreover, by this process, N-80 and P-110 grades of superior toughness and ductility can be produced.

What is needed . . . Deeper drilling is being retarded by a shortage of tubular goods. This applies especially to pipe strong enough to withstand the stresses imposed by large hanging loads and by high pressure gradients.

In setting a string of casing, the major stresses may be those of longitudinal tension, collapse, and burst. Better performance is gained by higher yield strength. Therefore, yield strength of the casing joint sets the depth limits.

If casing of higher yield strength is not available, subnormal design factors, heavy-weight pipe (having the disadvantage of restricting the well bore), or casing with special end design to increase joint strength must be used in deeper wells. Problems of a related nature with respect to tubing and drill pipe also face the operator.

High strength . . . By common acceptance, the term "high strength" refers to oil-country pipe with yield strength not lower than A.P.I. grades N-80 and E. By this definition, the high-strength category would include not only grades N-80 and E, but also A.P.I. grades P-110, with minimum yield strengths of 105,000 and 110,000 psi., respectively.[1]

In addition to these, certain proprietary grades of even higher strength levels in various stages of production and development enter the picture. No industry-wide standards control the minimum mechanical properties of these higher-strength grades at this time.

Two such grades contemplate minimum yield strengths within the ranges 140,000 to 150,000 psi. and 170,000 to 180,000 psi. Inasmuch as these experimental grades will enter the subsequent discussion, they will be designated, for clarity, "extra-high-strength" or EHS-140 and "ultra-high-strength" or UHS-170. With such a progression to higher-strength levels, the table of high-strength properties might appear as in Table 1.

Design Factors for Deep Drilling

A group of our associates have designed a number of casing strings intended for deep, abnormally high-pressure service. Certain stipulated design factors were used and major consideration was given to economy and simplicity of design. Two of the designed casing strings are shown in Tables 2 and 3—a 9⅝-in. o.d. protection string set to 17,000 ft. and a 5½-in. o.d. oil string set to 25,000 ft.

This project developed several major requirements including:

1. Performance properties considerably higher than currently offered by the standard list of A.P.I. weights and grades.
2. Heavier weights and greater wall thicknesses than presently available.
3. Yield strengths ranging upward to 170,000 psi. minimum to develop adequate performance properties and minimize the progression to heavier weights.
4. Couplings of greater outside diameter and cross-sectional area to

Authors are with Jones & Laughlin Steel Corp., Aliquippa, Pa. Paper presented at the 1957 spring meeting of the Southwestern District, A.P.I., Division of Production, Dallas, under the original title, "High-Strength Tubular Products for Deep Drilling."

TABLE 1—MINIMUM MECHANICAL PROPERTIES OF HIGH-YIELD-STRENGTH GRADES

Grade—	Minimum yield strength (psi.)	Minimum tensile strength (psi.)	Minimum elongation (per cent in 2 in.)
N-80	80,000	100,000	16
P-105	105,000	120,000	15
P-110	110,000	125,000	15
EHS-140	140,000/150,000	160,000/170,000	15
UHS-170	170,000/180,000	190,000/200,000	15

TABLE 2—DESIGN OF A HYPOTHETICAL 9⅝-IN. O.D. PRODUCTION STRING SET TO 17,000 FT. (TOTAL WELL DEPTH: 21,500 FT.)

Design Factors		
TENSION (neglecting buoyancy)	Long T & C	1.7
	Buttress	2.0
COLLAPSE (no internal pressure)		1.125
BURST (based on minimum yield strength and wall thickness—no external pressure)		1.125
BOTTOM-HOLE PRESSURE, psi.		14,110
MUD WEIGHT, lb./gal.		16

Depth interval	Footage	Wall thickness, in.	Wt. per ft., lb.	Grade	Joint	Section wt., lb.	Accum. wt., lb.	Design factors: Tension	Collapse	Burst
17,000-15,800	1,200	0.645	61.9	UHS-170	L T & C	74,280	74,280	High	1.151	High
15,800-14,100	1,700	0.690	65.8	EHS-140	L T & C	111,860	186,140	High	1.125	High
14,100-9,600	4,500	0.645	61.9	EHS-140	L T & C	278,550	464,690	High	1.125	1.23
9,600-6,100	3,500	0.690	65.8	P-110	L T & C	230,300	694,990	1.98	High	1.125
6,100-5,100	1,000	0.645	61.9	P-110	L T & C	61,900	756,890	1.70	High	1.125
5,100-2,400	2,700	0.645	61.9	P-110	Buttress	167,130	924,020	2.42	High	High
2,400-200	2,200	0.600	57.8	P-110	Buttress	117,700	1,041,720	2.00	High	1.125
200-0	200	0.645	61.9	P-110	Buttress	12,380	1,054,100	2.12	High	High

Note: Design or safety factors listed as "high" whenever following factors were exceeded: Tension, L T & C, 2.00; buttress, 2.20; collapse, 1.20; burst, 1.25.

TABLE 3—DESIGN OF A HYPOTHETICAL 5½-IN. O.D. OIL STRING SET TO 25,000 FT.

Design Factors		
TENSION (neglecting buoyancy)	Long T & C	1.7
	Buttress	2.0
COLLAPSE (no internal pressure)		1.125
BURST (based on minimum yield strength and wall thickness—no external pressure)		1.125
BOTTOM-HOLE PRESSURE, psi.		23,375
MUD WEIGHT, lb./gal.		18

Depth interval	Footage	Wall thickness, in.	Wt. per ft., lb.	Grade	Joint	Section wt., lb.	Accum. wt., lb.	Design factors: Tension	Collapse	Burst
25,000-23,300	1,700	0.602	31.5	UHS-170	L T & C	53,550	53,550	High	1.126	High
23,300-21,400	1,900	0.565	29.8	UHS-170	L T & C	56,620	110,170	High	1.125	High
21,400-19,500	1,900	0.527	28.0	UHS-170	L T & C	53,200	163,370	High	1.125	High
19,500-18,000	1,500	0.602	31.5	EHS-140	L T & C	47,250	210,620	High	1.125	High
18,000-16,200	1,800	0.565	29.8	EHS-140	L T & C	53,640	264,260	High	1.125	1.23
16,200-13,400	2,800	0.527	28.0	EHS-140	L T & C	78,400	342,660	High	1.125	1.188
13,400-10,000	3,400	0.602	31.5	P-110	L T & C	107,100	449,760	1.83	1.169	1.125
10,000-6,300	3,700	0.565	29.8	P-110	Buttress	110,260	560,020	2.00	High	1.125
6,300-5,200	1,100	0.602	31.5	P-110	Buttress	34,650	594,670	2.00	High	High
5,200-4,200	1,000	0.602	31.5	EHS-140	Buttress	28,000	622,670	2.00	High	High
4,200-2,900	1,300	0.565	29.8	EHS-140	Buttress	38,740	661,410	2.00	High	High
2,900-1,700	1,200	0.602	31.5	EHS-140	Buttress	37,800	699,210	2.00	High	High
1,700-300	1,400	0.565	29.8	UHS-170	Buttress	41,720	740,930	2.00	High	High
300-0	300	0.602	31.5	UHS-170	Buttress	9,450	750,380	2.09	High	High

Note: Design or safety factors listed as "high" whenever following factors were exceeded: Tension, L T & C, 2.00; buttress, 2.20; collapse, 1.20; burst, 1.25.

maintain joint strength in the extra-heavy casing weights.

5. Joints of special design for greater joint efficiency.

The foregoing factors are so closely interrelated that all must be considered in designing a casing program for extreme depths and pressures. Without higher-strength grades, design of such strings would be impossible.

How to Get High Strength

The producer of tubular products is concerned with how to develop not only adequate yield strength but also satisfactory related properties, principally ductility and toughness. His methods need to be economical.

For many years one of the steels most widely used in producing N-80 casing and tubing and grade E drill pipe has been a manganese-molybdenum grade. This steel, in which the required properties are developed by virtue of alloy content and by normalizing full length to a satisfactory compromise between strength and ductility, has performed well under operating conditions and will continue to do so.

For yield strengths above N-80 and E grades, however, the problem of maintaining adequate ductility and toughness without resorting to the excessive use of alloying elements must be faced. Increased alloy content can be a troublesome problem, because steel-making costs rise rapidly for relatively small improvements in the desired properties.

Jones & Laughlin produces P-105 grade by using a manganese-molybdenum-vanadium alloy with strict control of normalizing and tempering cycles when the product is heat-treated in the mill. Yet the cost of producing this grade indicates that any further increase in mechanical properties by means of alloying additions is not attractive.

Quench-and-temper process . . . The art of quenching and tempering has been practiced for several centuries, but application of these techniques to a wide range of carbon and low-alloy steels to promote great strength has become prominent in recent years.

The potentialities of the process as a means of gaining high-strength properties and retaining ductility and toughness in oil-country tubular goods were not appreciated until even more recently. Actually, there was little incentive to pursue the matter earlier because the high-tonnage grades such as H-40 and J-55 could be produced directly off the mill with no final heat treatment.

The advent of N-80 and E grades containing a moderate amount of alloying elements and requiring a normalizing heat treatment complicated matters for the manufacturer, but only small tonnages were required by the oil industry.

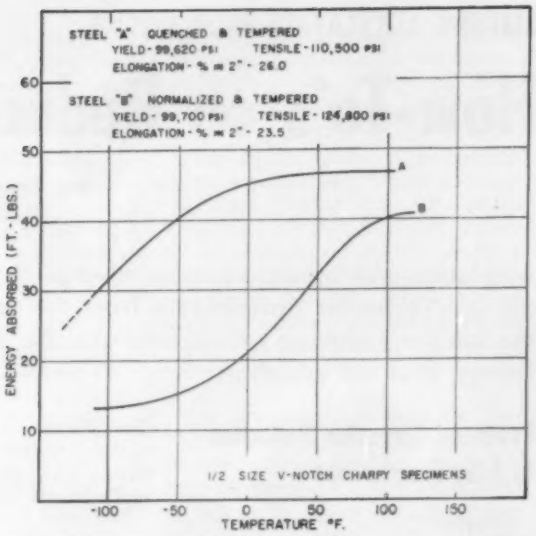
The potential need for yield strengths above N-80 grade provided the impetus for rapid development of the quench-and-temper process. What is just as pertinent at the moment, however, is the fact that the process is eminently suitable for high-tonnage production of N-80 grade also.

Properties . . . How do the properties of the quenched-and-tempered product compare with those of the more highly alloyed normalized grades? Moreover, is a measure of ductility and of toughness retained at super-high-strength levels or must these desirable properties be sacrificed completely in the interests of strength alone?

In answer to these questions it is premature to suggest that, in the short time since the introduction of quenched-and-tempered oil-well casing on a large scale, all characteristics of the product have been completely evaluated with respect to service performance. However, this knowledge is of great importance and a number of investigative groups are now active in this field.

. . . Ductility is believed to be related to successful performance. A most encouraging indication that ductility can be retained at strength levels in excess of P-110 grade is shown by Table 4. Here a few tests show that the quench-and-temper process can obtain yield strengths on the order of 150,000 psi. while retaining elongation values similar to normalized-and-tempered P-105 grade alloy steel. The figures for UHS-170 are even more striking. The example gives much assurance that high strength and acceptable ductility are not necessarily incompatible.

. . . The flattening test has shown that N-80 and P-110 quenched-and-tempered pipe will meet the requirements of A.P.I. Std. 5A easily. Moreover, the maximum deformation which can be imposed upon quenched-and-tempered pipe in flattening to failure experimentally, almost invariably exceeds that attained in conventional grades of similar strengths. The same is true of EHS-140 grade quenched-and-tempered pipe where the flattening characteristics are found to be favorable even when compared to P-105 grade pipe.



EFFECT OF TEMPERATURE on notch toughness—quenched-and-tempered carbon steel vs. normalized-and-tempered alloy steel. Fig. 1.

Serviceability . . . Often within the past few years, service failures have been blamed on surface defects in the product. These failures have caused much apprehension with respect to the toughness of high-strength pipe.

A conventional method used to measure the property of notch toughness or the ability of a material to absorb energy during rapid loading in the presence of a notch is the notched-bar impact test.[2] By breaking a series of notched-bar specimens of the same material at successively lower temperatures, the investigator can determine a temperature range wherein the mode of fracture changes abruptly from ductile to entirely brittle. This is called the transition temperature range. Those materials exhibiting the lower transition temperatures generally display a lesser tendency toward crack initiation and propagation, hence a greater toughness.

Within our experience, transition temperatures for the quenched-and-tempered steels are significantly better than those of the conventionally heat-treated steels at comparable strength levels. As an illustration, Fig. 1 depicts two steels with yield strengths of approximately 100,000 psi. Curve A represents a transition temperature study of a quenched-and-tempered pipe. Curve B represents a similar study of a normalized-and-tempered alloy-steel pipe. The difference in notch toughness is readily discernible and favors the quenched-and-tempered steel.

Although there has been no opportunity to investigate notch toughness of normalized steels at EHS-140 and UHS-170 strength levels, initial tests of the quenched-and-tempered steels at these higher levels indicate that a marked degree of notch toughness is maintained and appears favorable even when compared to the lower-strength alloy grades.

Future use . . . Most of the quenched-and-tempered pipe produced thus far has been in casing sizes and weights, but the process can be extended to include high-strength drill pipe, tubing, and line-pipe structures also. Considering drill pipe alone as an example, the property of fatigue-endurance limit becomes a pertinent matter, particularly as this property is affected by stress concentrations. The improved notch sensitivity which appears inherent in a properly quenched-and-tempered material at the strength levels studied indicates that improved performance in this respect may be anticipated.

TABLE 4—AVERAGE MECHANICAL PROPERTIES OF HIGH-YIELD-STRENGTH GRADES

Grade	Heat treatment	No. of heats	Yield strength, psi.	Tensile strength, psi.	Yield/tensile ratio	Elongation per cent in 2 in.
N-80	Normalize	636	93,213	125,848	74.0	23.0
N-80	Quench and temper	844	98,510	116,754	84.5	25.1
P-105	Normalize and temper	56	114,484	136,745	84.0	18.7
P-110	Quench and temper	110	127,665	145,341	88.0	22.8
EHS-140	Quench and temper	5	149,960	163,120	92.0	19.0
UHS-170*	Quench and temper	2	177,930	196,020	91.0	32.0

*Low alloy Cr-Ni-Mo steel.

References

1. A.P.I. Std. 5A: Specification for Casing, Tubing, and Drill Pipe, Twentieth Edition, February 1956.
2. United States Steel Co.: The Making, Shaping, and Treating of Steel, 1393-1400, Sixth Edition, 1951.

BLITZING ALKYLATION PROBLEMS—3

How-To's on Reducing Corrosion

by Larry Resen
District Editor

Alkylation-unit operators must always be on their guard against corrosion downstream from the reactor. Some of the solutions: change caustic strength, use alloys, use plastic linings, and use inhibitors.

Problem: Corrosion Reduction In Alky Fractionator

Solution: Several minor modifications and operational changes.

Discussion: To combat corrosion downstream of the unit reactors, several changes were made, all of which had some bearing on the ultimate improvement of the corrosion problem.

The first change was made at the caustic injection fitting on the reactor effluent line (point A). The process line carries the total alkylate stream plus normal and isobutane from the reactor system to the caustic wash drum. Just upstream of the drum, caustic is continuously injected into the effluent stream. Considerable corrosion took place near here, for as the caustic would begin to neutralize the acid in the effluent, the resultant weak acid would attack the line.

The corrosion took place slightly downstream of the injection nozzle where neutralization would begin. Steel pipe had an average life of 30 days; monel linings would only last about 90 days in this service. The change was made to saran-lined pipe. This eliminated the aggravated corrosion problem, with the lined pipe having a life greater than the normal unit run between turnarounds.

New valves . . . After the caustic had been injected into the effluent stream, the stream passed through three Duriron mixers. However, the pipe enclosing these also was subject to corrosive attack and they were replaced by two Alloyco 20 globe valves (point B). The valves were placed into the line backwards and this arrangement provided enough turbulence to mix the caustic and effluent.

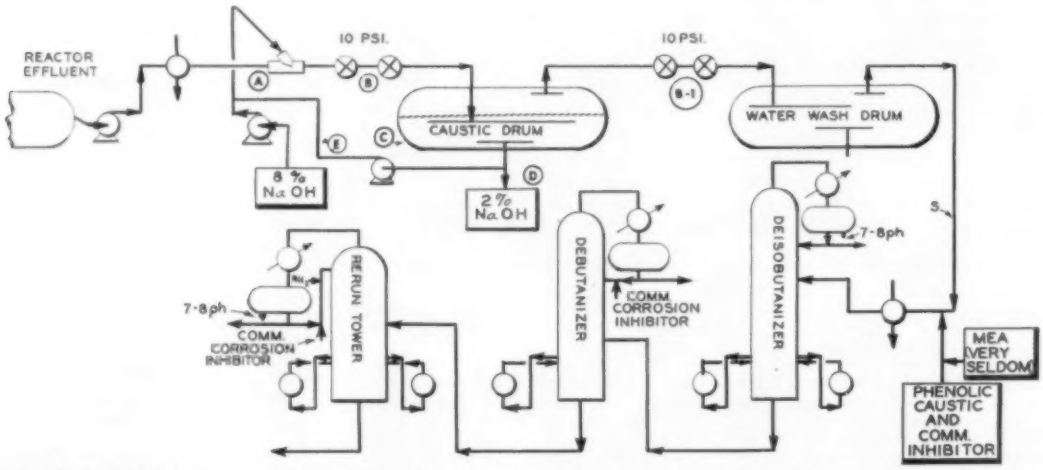
The presence of the valves also makes it possible to maintain a desired pressure drop simply by pinching the valves, one of which is used as a standby. A minimum drop of 10 psi. is held to get neutralization. The valves are adjusted as the flow changes to maintain this condition. The amount of mixing is proportional to the square of the pressure drop. However, if too great a drop is allowed, capacity will be reduced and the effluent won't separate out of the liquid.

The effluent-caustic mix discharges into a caustic settling drum through a distributor pipe. Effluent is taken overhead to the water wash system. Previously, the distributor had been positioned above the caustic level in the drum. This was changed and the distributor was positioned so that it is always submerged in the caustic layer.

The hydrocarbons in the effluent therefore have to bubble up through the caustic into the hydrocarbon layer. In this manner, any acid still entrained with the hydrocarbon would be likely to encounter the caustic and be neutralized. Hence, the drum takes on a twofold function, both as a settler and as an additional step in the neutralization process. This additional contract results in less corrosion in downstream reboilers.

Caustic strength . . . Caustic is withdrawn from the bottom of the settler and recycled into the injection fitting (point D). A slipstream is withdrawn from the recycle stream and 8 per cent caustic is added for makeup purposes. Experience has shown that the weaker the strength of the circulating caustic, the better the job of neutralization which takes place. A maximum of 2 per cent caustic is held in the settling system. The incoming acid strength and volume along with the effluent determines the amount of makeup used to maintain the strength.

The circulation rate (E) also has a



SEVERAL CHANGES were made to reduce corrosion downstream from the reactor on this alkylation unit. Numbers A—E show where revisions were made.

bearing on the efficiency of neutralization. To increase the caustic recycle flow rate, more jets were added to the pump turbines and larger flow lines were installed. These modifications have permitted caustic circulation to be upped so that 1 bbl. of caustic is circulated with each 1½ bbl. of effluent. It would probably be better if additional caustic could be circulated.

As was noted, reactor effluent carries over from the caustic settling drum. Water is injected into this line, and the water-washed effluent is settled out in a drum where water is withdrawn from the system. The mixers on this line weren't being severely attacked by corrosion. However, it was desirable to have the positive control of agitation and pressure afforded by the installation of globe valves, and two of these were installed backwards as in the case of the caustic-effluent line (point B-1). One barrel of water is used for every 7½ bbl. of effluent charged.

Inhibitors . . . In addition to the mechanical changes noted above, corrosion inhibitors have been used on the downstream fractionators. Phenolic caustic and commercial corrosion inhibitor are introduced ahead of the preheater on the deisobutanizer. Commercial inhibitor is also being used in the reflux lines of the debutanizer and rerun towers. Additionally, ammonia is injected in the rerun tower overhead for pH control.

The pH off the deisobutanizer accumulator is used as control upstream of the rerun tower. Interestingly, methanolamine is added to the inhibitors entering the preheater on the deisobutanizer. However, with the submerging of the inlet distributor in the caustic drum, this addition has been negligible.

With the changes noted and the inhibitor system, reboiler life is much longer. Trouble and leaks had been previously experienced after 1-3 months of operation. The reboilers have now run 1 year with no tube failures and no leaks were detected on the tubes at the annual turnaround. Work is now being done using an inhibitor plus detergent to prevent fouling.

Problem: Corrosion Reduction In Alkylate Fractionator

Solution: Use low operating temperature.

Discussion: In the operation of some alkylation units, many refiners have taken expensive preventive measures, particularly in alkylate fractionators, to stop corrosion resulting from breakdown of acid esters formed during the process. The esters result from side reactions and in themselves are relatively harmless.

However, in passing through the various towers in the process, esters break down. Polymers are formed thereby and sulfur dioxide and some trioxide are released into the system. The result is a corrosive atmosphere plus the presence of heavy material. The combination tends to cause plugging and fouling of reboilers.

In operation of one alkylation unit, on-stream performance led to a decision to subject the reactor effluent to no greater temperature than 340° F. in the gas-recovery system. The thought behind this was that the low temperature would tend to avoid ester breakdown.

The result has been quite promising. Corrosion has been practically eliminated in the alkylate fractionator, where it previously had been most severe. No special precautions or equipment have been necessary on this tower or on the debutanizer. Plugging of reboilers, meanwhile, has also been practically eliminated. The alkylate fractionator operates at about atmospheric pressure or at a slight vacuum.

Sufficient heat for fractionation is provided by a steam-heated feed preheater and the injection of live steam into the tower. Throughput and product quality have not been affected.

Problem: Increasing Contact Time in Caustic-Wash System And Reduce Corrosion

Solution: Install contact drums and use Hastelloy fittings.

Discussion: In a caustic-wash system, reactor effluent was not being completely neutralized. With increased throughput, the single Dur-iron mixer originally installed was unable to provide the necessary mixing. Addition of a second mixer helped but neutralization was still incomplete. More contact time was needed and two short vessels were installed in the line.

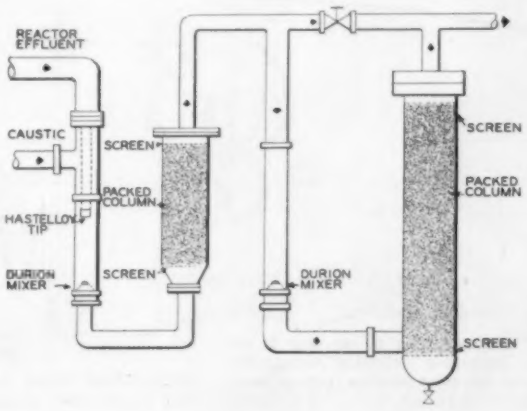
The vessels are 1½ ft. in diameter and are packed with 1½-in. iron nipples. One is about 4 ft. tall and the other about 7 ft. tall. Each was installed immediately downstream of a Dur-iron mixer. Caustic-effluent flow now passes through a mixer, through a packed column, through the second mixer and then through the second column before entering the caustic settler.

For all practical purposes, the flow line, in effect, widens at the two packed towers. The net result has been to increase the contact time to permit proper neutralization of the acid in the effluent stream. This installation has resulted in less downstream fouling and corrosion.

Caustic injection . . . In the caustic-wash system, caustic strength is maintained at 1½-2 per cent by means of a continuous makeup and drawoff. Circulating caustic is added to the effluent stream in a pot, with effluent coming in through a nozzle and caustic entering through a side port. The combined caustic-effluent flow then passes through the mixers and vessels as noted above.

Previously, the effluent injection pipe or nozzle would be severely attacked by corrosion to the extent that it would be eaten away. This shortened the pipe and caused mixing of the caustic and effluent so that the sides of the mixing pot would be severely attacked.

A Hastelloy tip was welded to the end of the pipe to serve as the nozzle. This alloy, being resistant to acid attack, has held up quite well in service. One tip will usually last for two unit runs. It is replaced as required. However, during its life it will maintain the proper nozzle length and this has resulted in a sharp reduction in corrosion in the mixing pot.



MIXING VESSELS were added to this unit to increase caustic-mixing time and increase the mixing action.

Should you

Fracture Water-Flood Wells?

The answer is yes, provided wells are properly chosen and treatments are small. Here is how one operator is successfully using well-fracturing in water floods.

by Jesse E. Wyrick

SINCE hydraulic fracturing methods became commercially available to the oil industry, hundreds of wells have been fracture treated and many oil fields have been developed by using fracturing processes.

However, there was one segment of the industry that did not immediately accept this new tool. Many people engaged in secondary recovery (and especially people engaged in water flooding) were reluctant to try fracture treatments. The secondary-recovery industry was well aware of the dangers of pressure parting of the formation with resultant fluid channeling.

As knowledge and experience on fracturing methods increased, fracture treating in water-flood operations became widespread and in many floods both water injection and oil production wells have been fractured.

Why has fracturing been successful?... Fig. 1 shows a theoretical pressure distribution in a formation surrounding a producing well. For simplification, well pressure is assumed 0 psi. and reservoir pressure 500 psi., and a simple fluid is assumed to be flowing at constant rate.

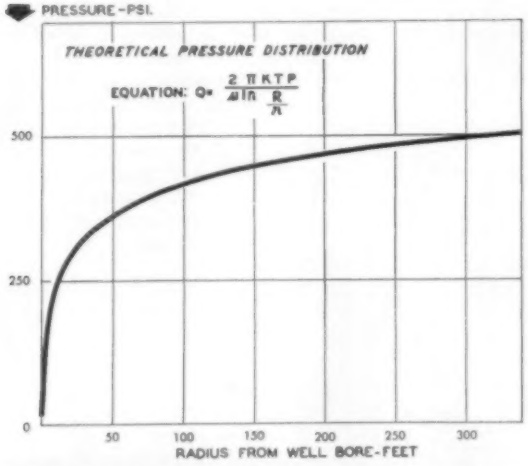
It is readily seen that a large percentage of the pressure drop occurs within a few feet of the well bore. Although the above conditions will never be encountered in a reservoir, still a large percentage of the total reservoir energy is utilized to move fluids the last few feet into the well bore. This will be true whether you are injecting fluids into the formation or removing fluids.

Author is production engineer, Pure Oil Co., Nowata, Okla. Paper presented at Kansas-Oklahoma Water-Flood Operators Association meeting, Independence, Kans.

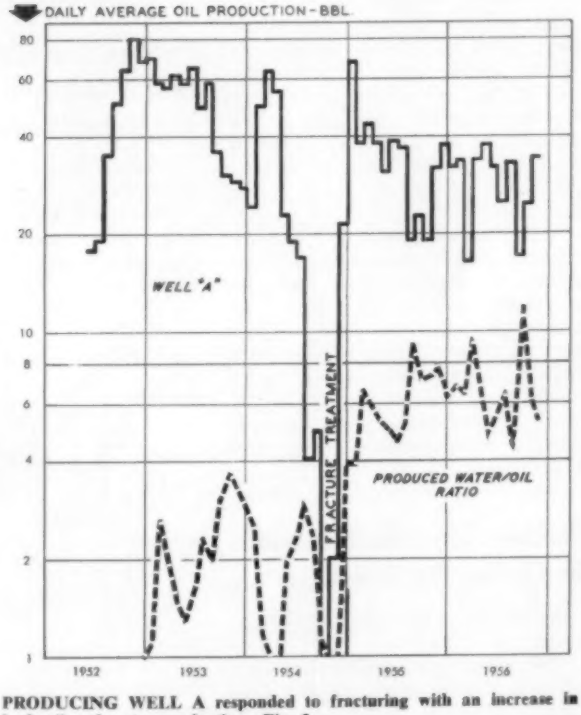
PRODUCING

All methods that can be used to remove flow restrictions from the area of the well bore should be considered. Actual fracturing of the formation by the use of nitroglycerin or injection of sand-laden fluid may be used in some cases. There is no one method of increasing the productivity index that will be successful in every instance. Every field and every formation and every well require individual consideration.

Fracturing in floods . . . In Nowata County, Oklahoma, we have sand fractured several oil wells in water floods. The reasons for selecting the particular wells for treatment are varied. Some of the wells fractured were edge wells from which little production could be expected. Some of the



HIGH PRESSURE DROP near the bore of the well is the reason for fracturing wells. Increasing formation permeability here will allow higher flow rate for same pressure drop or lower drop for same rate. Fig. 1.



PRODUCING WELL A responded to fracturing with an increase in both oil and water production. Fig. 2.

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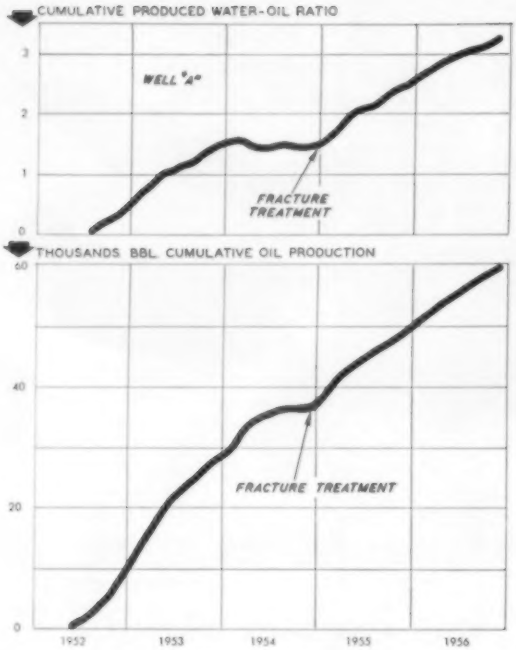
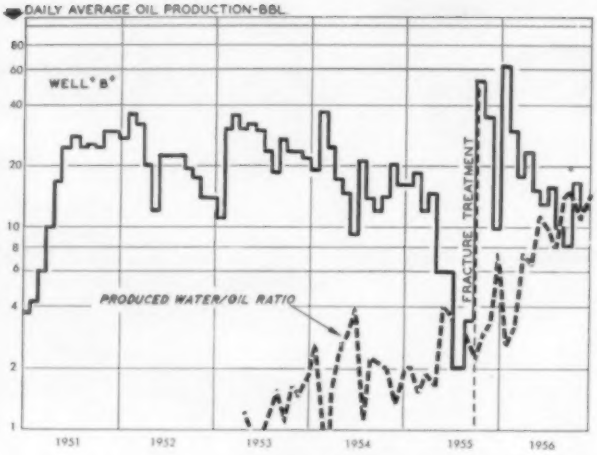


WELL A TOTAL production took a marked upturn after fracturing decreased well-bore resistance. **Fig. 3.**



PRODUCING WELL B increased oil production after fracturing. Upward trend of water cut started before fracturing. **Fig. 5.**

wells fractured had approached fillup but had not yet begun to produce due to permeability barriers in the vicinity of the well bore.

Some of the wells fractured had been prolific producers but had gradually plugged themselves by the deposition of calcium sulfate and barium sulfate in the vicinity of the well bore. The one thing that all of these wells had in common were that they had approached fillup and also that they were producing very little fluid.

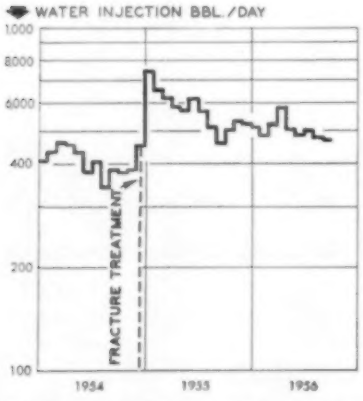
The size of the fracture treatments has ranged from 500 gal. of fracturing fluid with 1,000 lb. of sand to 5,000 gal. of fracturing fluid with 10,000 lb. of sand.

Low-viscosity oil has been purchased for some treatments and our lease crude has been used in some instances. Our sand has been the standard range, 20-40 mesh. Fluid-loss additives have been used in all recent treatments. Temporary plugging agents were used in a few treatments in an attempt to plug off the more permeable zones and thereby fracture the tighter sand zones.

I have chosen three typical well treatments for discussion. The results obtained from fracturing these wells were not particularly outstanding but the treatments were considered to be commercially successful.

Well A

Well A was completed in May 1952 with 5½-in. casing set above the producing formation at 1,010 ft. with 15 sacks of cement. The Bartlesville sand was shot with 87 qt. of liquid nitroglycerin from 1,020 to 1,055 ft. The well began producing in June 1952



WATER INJECTION in well A injection pattern also increased after well A was fractured. **Fig. 4.**

The author says . . .

- We do not ordinarily fracture oil wells if they are producing the same volume of fluid that is being injected. Fracture treatments are used only where there is a discrepancy between injected and produced fluids.
- No improvement can be expected by fracturing oil wells if the water-injection wells will not take water.
- We have noticed no special relationship between size of treatment and results obtained.
- We would rather leave some sand in the well bore than to overflush. We ordinarily shut a well in for a few hours after fracture treatment before we backflow.
- We consider fracture treatments as a method for conditioning the well bore only, in that we are not attempting or wanting deep penetration into the formation.
- On initial well completions we will ordinarily shoot a well with nitroglycerin in preference to sand fracturing.
- We do not plan on fracturing all of our wells but we do consider sand fracturing to be a useful tool to be used along with other methods of well conditioning.

Congrats and $25 to A. V. McIvor, 1255 Wabash St., Pasadena, Calif., for this quip.

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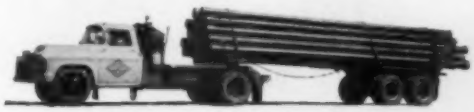

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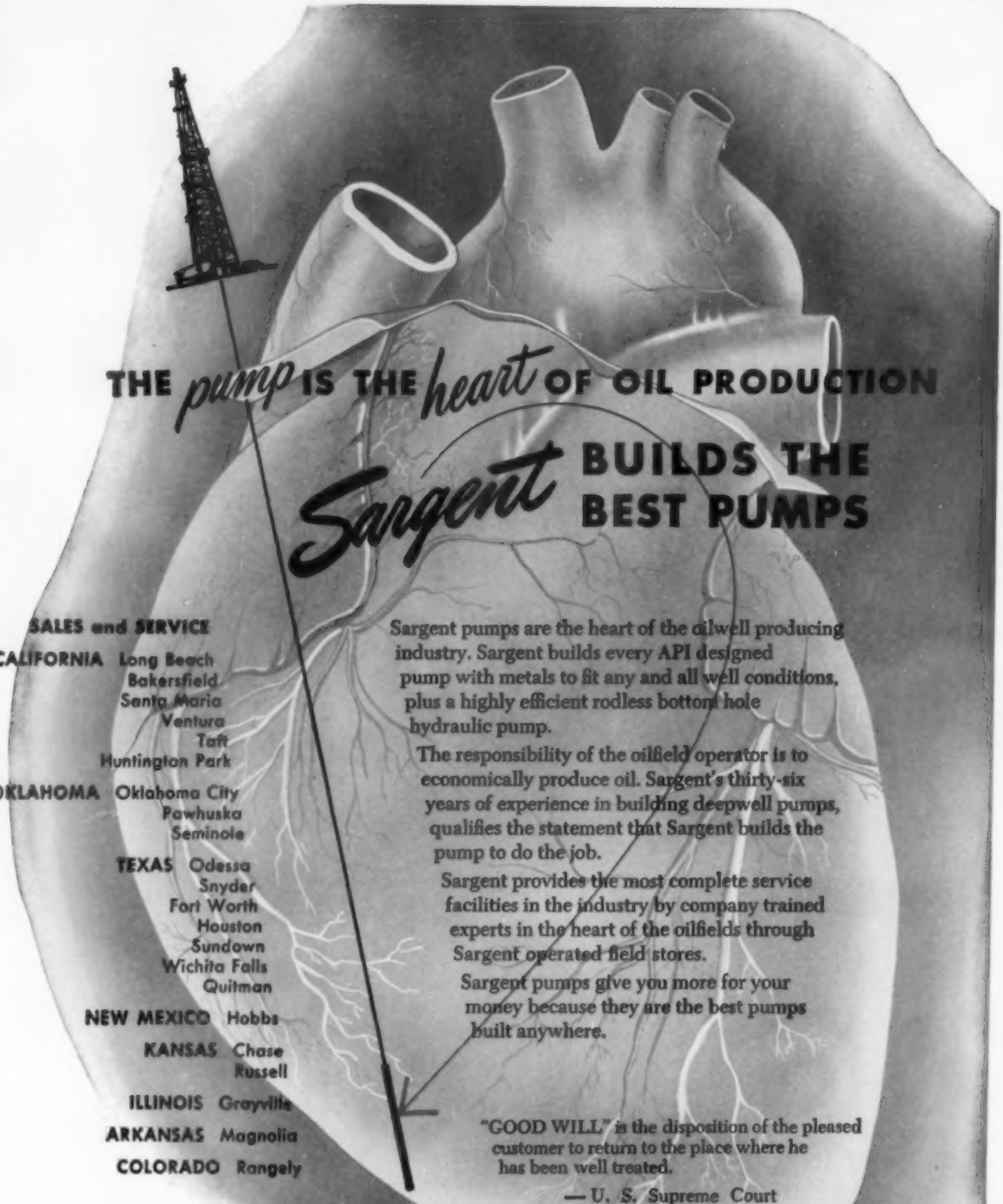

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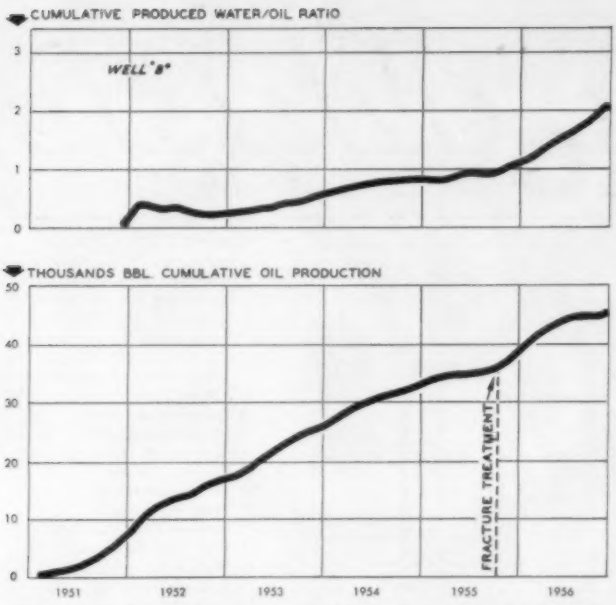
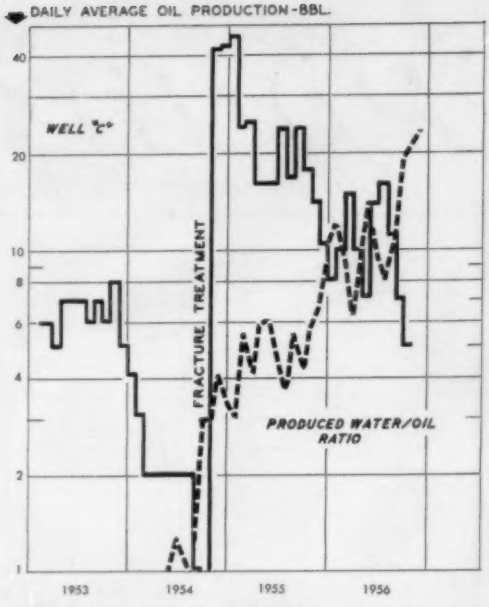


WELL B TOTAL production was boosted by fracturing after a tendency to level off. Well was shot with nitroglycerin once, early in 1953. Fig. 6.



PRODUCING WELL C after fracturing produced oil at a daily rate more than 5 times the maximum before fracturing. Fig. 8.

with an initial production of 18 bbl. of oil per day and no water. Although the rate of production was never high, it remained satisfactory until late in 1954 at which time total fluid production began declining at an alarming rate.

In December 1954 a cup-type hold-down packer was set at 993 ft. on 2-in. tubing and the well was fractured with 3,000 gal. of oil and 6,000 lb. of sand. The production before reconditioning was 2 bbl. of oil and 2 bbl. of water per day. The production after reconditioning was 72 bbl. of oil and 194 bbl. of water per day.

Results . . . Fig. 2 shows the daily oil production and water-oil ratio. Almost every anomaly on this chart can be explained. However, it is beyond the scope of this article to delve into production problems other than those having a direct bearing on the fracture treatment of this well and only the general trend of production should be noted.

Through November 1956 this well had produced 23,369 bbl. of oil since fracturing as compared to 36,328 bbl. of oil produced before fracturing.

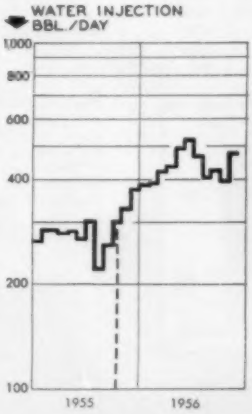
Fig. 3 shows the cumulative oil production and cumulative water-oil ratio.

Injection into offset water-injection wells increased 90 bbl. per day during the month following this treatment as compared to the month preceding this treatment. Water injected into the well A injection pattern is illustrated in Fig. 4.

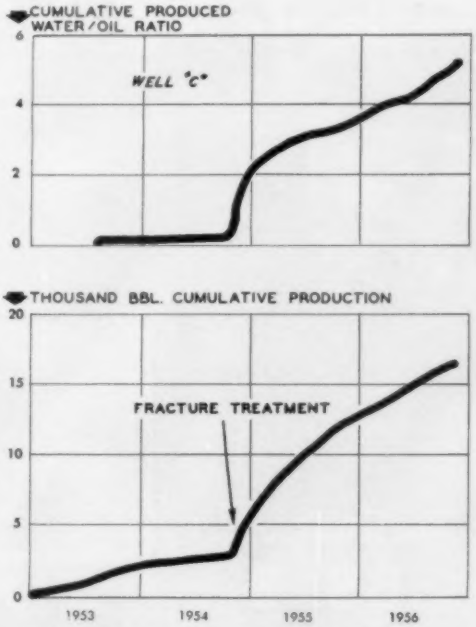
Well B

Well B was completed in June 1949 with 5½-in. casing set at 1,025 ft. above the producing sand with 15 sacks of cement. The well began producing water-flood oil early in 1951. In February 1953 the Bartlesville sand was shot from 1,035 to 1,078 ft. with 43 qt. of liquid nitroglycerin. By 1955 the fluid production from this well had declined until remedial work became necessary.

In October 1955 a packer was set at 1,000 ft. on 2-in. tubing and the



WELL B fracturing caused this increase in water injection in its pattern. Fig. 7.



SHARP INCREASE in total production after fracturing of well C is oil that probably would not have been produced otherwise. Fig. 9.

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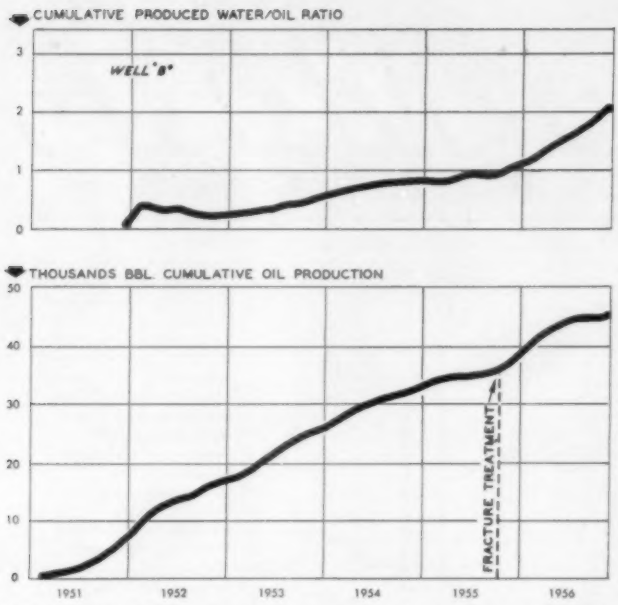
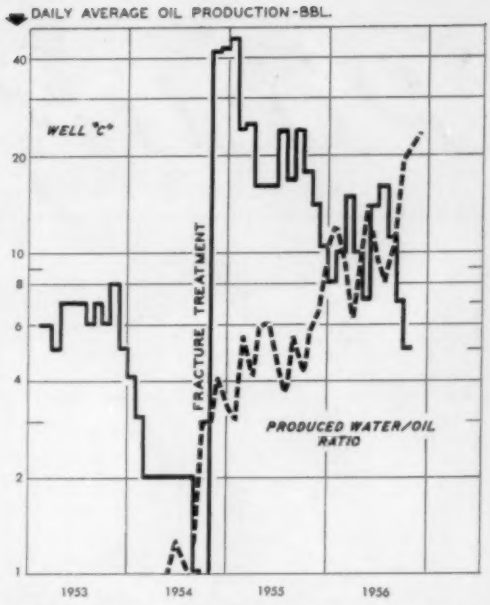


WELL B TOTAL production was boosted by fracturing after a tendency to level off. Well was shot with nitroglycerin once, early in 1953. Fig. 6.



PRODUCING WELL C after fracturing produced oil at a daily rate more than 5 times the maximum before fracturing. Fig. 8.

with an initial production of 18 bbl. of oil per day and no water. Although the rate of production was never high, it remained satisfactory until late in 1954 at which time total fluid production began declining at an alarming rate.

In December 1954 a cup-type hold-down packer was set at 993 ft. on 2-in. tubing and the well was fractured with 3,000 gal. of oil and 6,000 lb. of sand. The production before reconditioning was 2 bbl. of oil and 2 bbl. of water per day. The production after reconditioning was 72 bbl. of oil and 194 bbl. of water per day.

Results . . . Fig. 2 shows the daily oil production and water-oil ratio. Almost every anomaly on this chart can be explained. However, it is beyond the scope of this article to delve into production problems other than those having a direct bearing on the fracture treatment of this well and only the general trend of production should be noted.

Through November 1956 this well had produced 23,369 bbl. of oil since fracturing as compared to 36,328 bbl. of oil produced before fracturing.

Fig. 3 shows the cumulative oil production and cumulative water-oil ratio.

Injection into offset water-injection wells increased 90 bbl. per day during the month following this treatment as compared to the month preceding this treatment. Water injected into the well A injection pattern is illustrated in Fig. 4.

Well B

Well B was completed in June 1949 with 5½-in. casing set at 1,025 ft. above the producing sand with 15 sacks of cement. The well began producing water-flood oil early in 1951. In February 1953 the Bartlesville sand was shot from 1,035 to 1,078 ft. with 43 qt. of liquid nitroglycerin. By 1955 the fluid production from this well had declined until remedial work became necessary.

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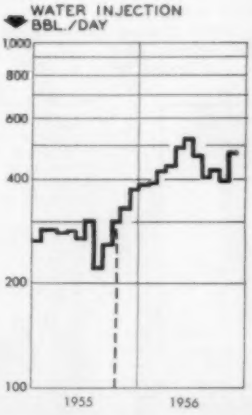
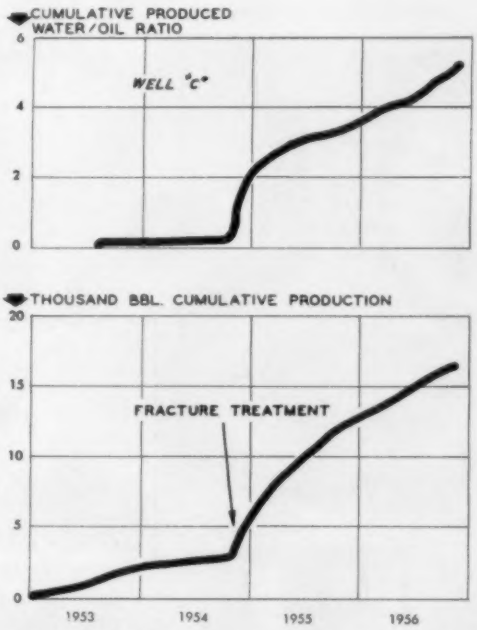


WELL B fracturing caused this increase in water injection in its pattern. Fig. 7.



SHARP INCREASE in total production after fracturing of well C is oil that probably would not have been produced otherwise. Fig. 9.

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LEASE SYSTEMS

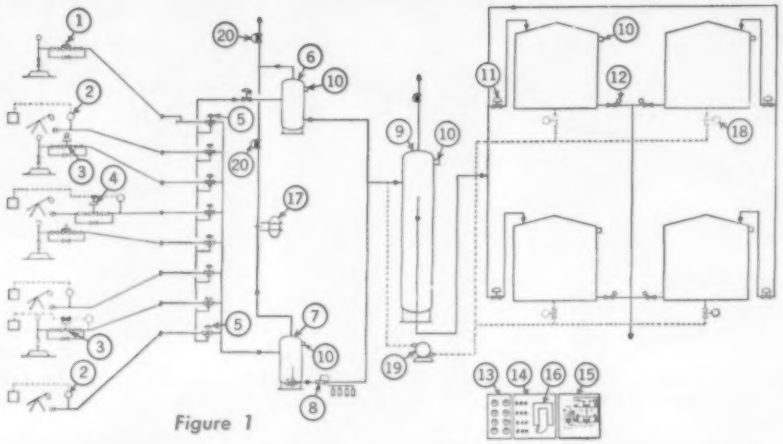


Figure 1

Legend:

1. Excess Flow Valve (Flowing Well)
2. Electrical Pressure Switch (Hi or Hi-Lo Shut-In on Pumping Well)
3. Pneumatic or Electro-Pneumatic Shut-In Valve (Hi or Hi-Lo Shut-In on Flowing Well)
4. Electro-Pneumatic Shut-In Valve (Hi or Hi-Lo Shut-In on Pumping Well)
5. 3-Way, 3 Position Header Valves
6. Production Separator
7. Metering Separator
8. Sampler W/Containers
9. Emulsion Treater
10. Hi-Level Detectors
11. Tank Fill Valves
12. Pipeline Valve Switches
13. Well Flow Controller
14. Well Test Controller
15. Battery Controller
16. Strip Chart Recorder
17. Integrating Flow Meter
18. Plug Valve Actuators
19. Rerun Pump
20. Gas Back Pressure Valve

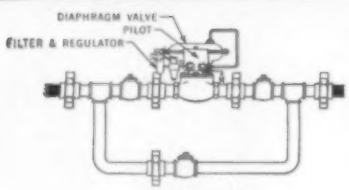


Figure 3

Wellhead Shut-In Control Assembly

THE PHANTO-PUMPER . . .

Is the name BS&B has given to its Automatic Control Systems which perform the following functions:

1. Wellhead Shut-In
2. Well Testing and Data Recording
3. Well Flow Programming
4. Tank Switching

Figure 1 typifies an automatic lease with PHANTO-PUMPER controls. The "nerve center" of any BS&B PHANTO-MATIC Lease System is the group of electrical controllers numbered 13, 14, 15 and 16.

AUTOMATIC WELLHEAD SHUT-IN EQUIPMENT . . . will control any combination of well flowing or pumping conditions. Examples of this equipment are:

1. Excess Flow Shut-In Control Assemblies
2. Hi-Low Pressure Shut-In Control Assemblies (Figure 3 at left)
3. Motor Shut-In Pressure Switch Assemblies
4. Electro-Pneumatic Motor Shut-In Pressure Switch and Control Valve Assemblies.

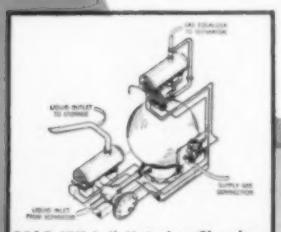
ELECTRO-PNEUMATIC WELL TEST CONTROL EQUIPMENT . . . automatically controls well test programming, routes the flow through test equipment and records test data. Some of the equipment offered as a part of this system includes:

1. Well Test Header and Manifold Assemblies With 3-Way Routing Valves and Master Lease Safety Shut-In Valve.
2. Electrical Well Test Controller With Strip Chart for Recording Well Test Data.
3. Liquid and Gas Metering Equipment, Including Complete Lines of Metering Separators, Metering Chambers, and Metering Treaters.
4. Liquid Sampling Equipment.

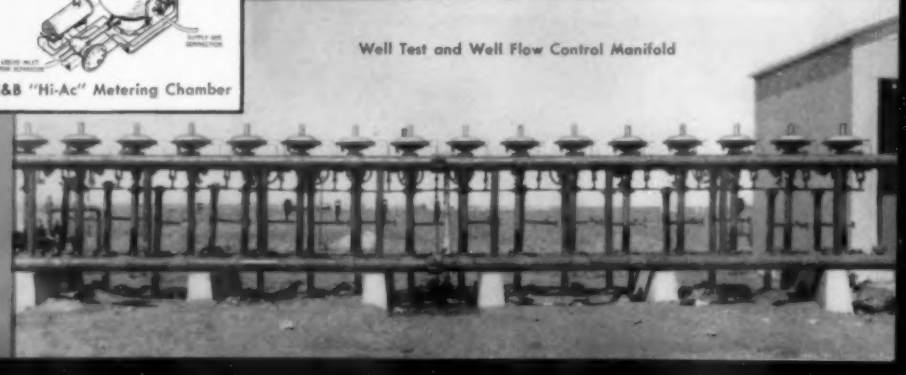
ELECTRO-PNEUMATIC WELL FLOW CONTROL EQUIPMENT . . . automatically programs flow from wells by "stop-cocking" at a central header. Some of the equipment offered as a part of this system includes production header and manifold assemblies with "stop-cocking" valves — or with 3-way routing and "stop-cocking" valves when combined with well test.

PHANTO-SWITCHER ELECTRO-PNEUMATIC TANK BATTERY CONTROL EQUIPMENT . . . automatically fills all tanks to capacity in a pre-set sequence, and automatically by-passes tanks already full or being run to the pipeline. Tanks can be selectively locked out of sequence for cleaning or inspection. If all tanks become full or otherwise unavailable for filling, the controller will automatically shut in system or actuate an alarm circuit.

Phanto-Pumper Control Panel



BS&B "Hi-Ac" Metering Chamber



Well Test and Well Flow Control Manifold

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BS&B PHANTO-MATIC Lease Systems are packaged from a wide selection of equipment components, thoroughly tested under field operating conditions. These systems, when grouped according to function, fall generally into two primary classifications—PHANTO-PUMPER and PHANTO-GAGER.

THE PHANTO-GAGER...

Is the name BS&B has given to its Automatic Control Systems which perform the following functions:

1. Automatic Measurement and Recording of Temperature Compensated Oil Volume in Barrels.
2. Automatic Measurement (or Automatic Sampling and Subsequent Determination) of Quality and Contaminant.
3. Automatic Running of Crude From a Lease Into Connecting Pipeline in Accordance with Predetermined Schedules on an Unattended Basis.

Figure 2 typifies an electro-pneumatic, volumetric metering tank type automatic custody transfer system. This system is offered in various sizes as a skid-mounted assembly, with single or multiple metering and surge tanks.

Fail-safe controls throughout the system insure that no oil will be lost in case of power failure. Oil cannot be introduced into the metering vessel after the measuring cycle has started, nor can oil be removed from the meter tank (other than to the pipeline) after the top gage has been made and before the run is completed.

For Further Information, Contact Your Nearest BS&B Representative—or Write To...

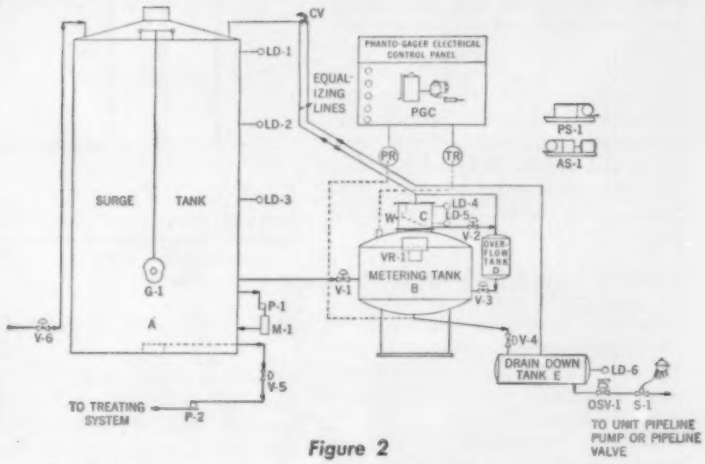

Figure 2

Legend:

LD	— Level Detector	VR	— Temp. Comp. Volume Recorder & Printer	AS	— Air Supply Unit
V	— Valve	TR	— Temperature Recorder	P	— Pump
CV	— Check Valve	PR	— Pressure Recorder	W	— Weir
M	— BS&W Monitor	PS	— Power Supply Unit	C	— Overflow Chamber
S	— Sampler			OSV	— Oil Seal Valve
				PGC	— Phanto-Gager Controller

Phanto-Gager

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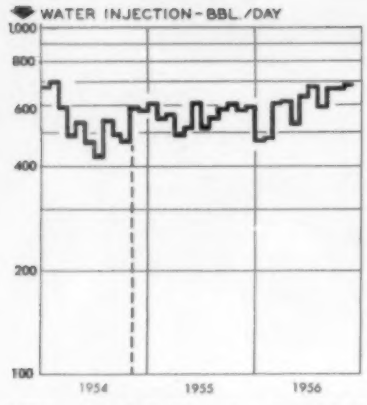
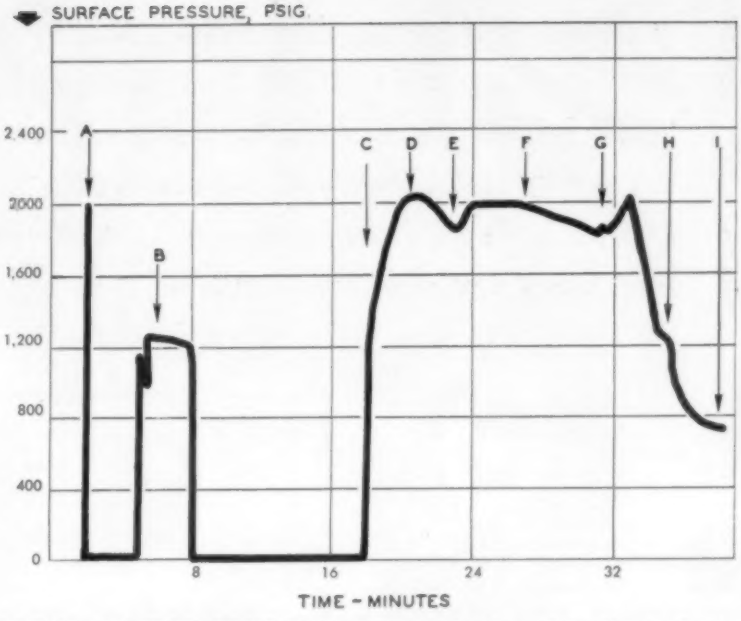


WELL C PATTERN took only slightly more water after well C was fractured. Fig. 10.



TYPICAL FRACTURE TREATMENT of the Bartlesville sand in Nowata County, Oklahoma, shows formation breakdown at slightly more than 1 psi. per foot of depth. As described below, 3,000 gal. of oil with 6,000 bbl. of sand was injected at about 6 bbl. per minute. Fig. 11.

well was fractured with 2,000 gal. of lease oil and 4,000 lb. of sand. The production before treatment was 4 bbl. of oil and 8 bbl. of water per day. The production after treatment was 64 bbl. of oil and 96 bbl. of water per day.

Results . . . Fig. 5 illustrates the daily oil production and water-oil ratio. Some irregularities in this chart are caused by the well being shut in during part of May 1952 and the well being shot with liquid nitroglycerin in February 1953.*

Through November 1956 this well had produced 10,141 bbl. of oil since treatment as compared to 35,783 bbl. of oil produced prior to the fracture treatment.

Fig. 6 shows the cumulative produced oil and the cumulative water-oil ratio.

Water injected into the well B injection pattern increased an average of 17 bbl. per day per well following this fracture treatment. Fig. 7 is well B pattern injection.

Well C

Well C was completed in December 1952 with 5½-in. casing set at 1,003 ft. with 15 sacks of cement. The Bartlesville sand was shot with 50 qt. of liquid nitroglycerin from 1,008 to 1,028 ft. Although the well became active in January 1953, an accumulative total of only 2,851 bbl. of oil and 583 bbl. of water had been produced through October 1954.

On November 1, 1954, the well was fractured using 3,000 gal. of oil and 6,000 lb. of sand through a packer set at 995 ft. on 2-in. tubing. The daily production before treatment was 1 bbl. of oil and 3 bbl. of water. After treatment the production was 46 bbl. of oil and 207 bbl. of water per day.

Results . . . Since the fracture treatment 13,696 bbl. of oil has been produced through November 1956. Fig. 8 shows the daily production and water-oil ratio and Fig. 9 is the cumulative production and water-oil ratio.

Water injected into the well C injection pattern increased an average of 15 bbl. per day per well following this fracture treatment. Fig. 10 shows the well C injection pattern.

Typical treatment . . . Fig. 11 illustrates a typical fracture treatment of 3,000 gal. of oil with 6,000 lb. of sand. The letter designations on the graph represent the following:

A—Test connections.

B—Broke down formation with 20 bbl. of 36° crude oil at an average rate of 6⅓ bbl. per minute.

C—Start sand fracture—¾ lb. per gal.

D—Increased sand to 1½ lb. per gal.

E—Increased sand to 2 lb. per gal.

F—Increased sand slightly.

G—Sand fracture in at average rate was 6 bbl. per minute—start flush of 12 bbl. 36° crude oil.

H—Flush complete — average rate 6½ bbl. per minute.

I—Shut-in pressure of well.

This is an actual well treatment as performed. Had depth of fracture penetration been of prime importance, then the fracture treatment would have followed immediately after breakdown in order to keep the breakdown oil from bleeding from the induced channels into the formation.

*A slight increase in production during early 1954 was due to cleaning cavings from the hole.

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THE CONTINUOUS DIPMETER

. . . Its use—and abuse

by Jack Grynberg and M. I. Ettinger

Part 2

Part 1 appeared April 1, 1957

THE various methods used in the interpretation of dipmeter data may be classified in two main categories: the mechanical device, and the mathematical-graphical technique. The first method uses a mechanical instrument where the data obtained from the dipmeter are transplanted to the instrument, which consists of an adjustable table and axis. The bore-hole conditions are reconstructed on the instrument in such a manner that the table represents a given bedding plane and the axis represents the bore hole itself. The table can be set in accordance with the displacements measured on the dipmeter, and the axis can be tilted for hole inclination. The amount of dip and its direction are read directly from the instrument's scales.

The second method uses various mathematical and graphical procedures to compute a dip and its direction. In this paper, only two types of this interpretation will be illustrated; one using polar coordinate paper and stereographic net projection, the other using several mathematical formulas and stereographic net projection.

Fig. 2 (see Part 1) is a section from a TDM* continuous MicroLog dipmeter. In this dipmeter each of the three curves records from electrodes arranged in a MicroLog pattern the variation of resistivities of a penetrated section. A dip computation is made for one marker bed at a depth of 5,932 ft. When correlating the three curves, the No. 1 curve is used as a reference point and its relative elevation is assumed to be zero. The vertical displacement of the other two curves is measured above or below the reference point and is designated as (plus) or (minus) respectively. The commonly used vertical scale of the dipmeter log is 1:20, or 6 in. is equivalent to 10 ft. When measuring the vertical displacement, maximum accuracy is necessary; an error of 1/30 in. can throw the magnitude of dip

*Since writing this article, the authors have been advised that the TDM dipmeter is now designated CDM-T and the CDM dipmeter is now designated CDM-P.

Authors are with Jack Grynberg & Associates, Denver.

Here's how to calculate dip surveys . . .

ALL the steps used to determine graphically the true dip and its direction may be summarized in the following form:

STEP 1 . . . Choose a marker bed and obtain from the dipmeter log the actual vertical displacement of corresponding points on No. 2 and No. 3 curves from No. 1 curve. Also obtain the hole radius, azimuth of No. 1 electrode, and bore-hole-inclination vectors and their respective directions or the magnitude and azimuth of the bore-hole inclination. Plot the position and elevation of electrodes 1, 2, 3 on polar coordinate paper.

STEP 2 . . . Connect the highest and lowest electrode points and find the horizontal projection of the point having the same elevation as the other electrode.

STEP 3 . . . Connect the other electrode and the point found in Step 2. This line is the uncorrected strike line.

STEP 4 . . . Construct a perpendicular to the uncorrected strike line from the electrode point farthest from the strike line. From the intersection, scale along the strike line a distance equivalent to the difference of elevation between the farthest electrode point and the electrode point on the strike line. Determine the angle of uncorrected dip mathematically or with the aid of a protractor.

STEP 5 . . . Construct a line perpendicular to the strike line from the center of the polar coordinate paper always in the downdip direction. This line is the uncorrected direction of dip.

STEP 6 . . . Solve for the magnitude and azimuth of hole inclination unless it is recorded directly. **From now on, overlay the polar coordinate paper on the stereographic net with coinciding centers.**

STEP 7 . . . Put the uncorrected downdip direction along the stereographic net's E-W line, and scale the amount of uncorrected dip to obtain point F.

STEP 8 . . . Put the hole-drift direction along stereographic net's E-W line. From point F, scale along a small circle the amount of hole-drift angle, always in the opposite direction from the hole drift, to obtain point G.

STEP 9 . . . Put point G along the stereographic net's E-W line and scale the degrees from the center of the net to point G. This is the magnitude of the corrected dip angle.

STEP 10 . . . Connect point G with the center. This line is the corrected dip direction from the magnetic north. Alter the direction of dip with the aid of proper magnetic declination, to read from geographic north.

by several degrees and the dip direction in excess of 15° depending on other prevailing conditions. A scale with 60 divisions to an inch should be used. The number of divisions read off this scale is divided by 60 to convert to inches of measured displacement and subsequently multiplied by 20 to obtain the actual vertical displacement between corresponding points in the bore hole. Thus the difference of elevation between corresponding points on No. 1 and No. 2 curves was 40 divisions on a 60 scale; and the difference between the same corresponding points on No. 1 and No. 3 curves was 27 divisions.

The continuous dipmeter log is usually quite long. Thus, it is very difficult to spread it out and follow the various scales down to a desired depth. Even if this is done, a mistake in reading the proper value is likely to occur. You can, however, cut off the heading from the dipmeter log and use the scales on it. But it is simpler to have all the scales redrawn on a piece of transparent plastic or sturdy transparent paper. These scales are then used to obtain, at any depth, the values of bore-hole diameter, azimuth of No. 1 electrode, and two vector readings of hole inclination from the TDM dipmeter. In the CDM dipmeter the magnitude and azimuth of hole inclination are recorded directly and therefore different scales have to be used. Fig. 4 is an arrangement of all scales necessary to obtain data from the TDM and CDM dipmeters. When reading the data from the dipmeter log, it can be tabulated in the following form:

Interval (ft.)	Actual vertical displacement with respect to No. 1 curve (in.)		Azimuth (deg.)			Hole inclination (deg.)				Hole radius (in.)
	No. 2	No. 3	No. 1	No. 2	No. 3	N	E	S	W	
5,932	—13.3	—9	70	190	310	0.5	2.5	...	...	4.4

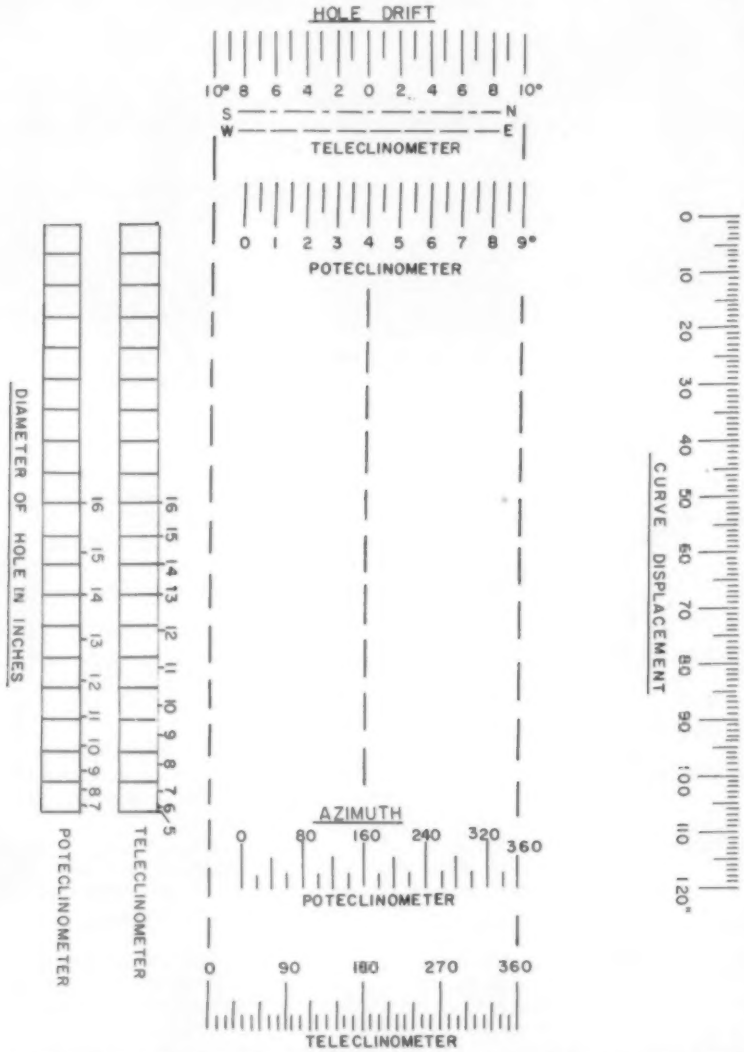
HOLE DRIFT
10° 8 6 4 2 0 2 4 6 8 10°
S
N
W
E
TELECLINOMETER
0 1 2 3 4 5 6 7 8 9°
POTECLINOMETER
DIAMETER OF HOLE IN INCHES
16 15 14 13 12 11 10 9 8 7
POTECLINOMETER
16 15 14 13 12 11 10 9 8 7 6 5
TELECLINOMETER
AZIMUTH
0 80 160 240 320 360
POTECLINOMETER
0 90 180 270 360
TELECLINOMETER
CURVE DISPLACEMENT
0 10 20 30 40 50 60 70 80 90 100 110 120"

Fig. 4—It is best to redraw the necessary scales on transparent plastic or paper. This precaution helps eliminate possible mistakes and insures greater accuracy in measuring values needed for dip calculations.

Determining the dip angle . . . Using the above tabulated data, the apparent dip and its direction may be determined with the aid of a polar coordinate paper. The word "apparent" interchangeable with "uncorrected" indicates that no correction for borehole inclination has been applied. The plot is arranged in such a manner that the position of the No. 1 point is located along a line of the azimuth of No. 1 electrode. All three points are located 120° apart on a circle whose radius is the radius of the hole, using the most convenient horizontal scale of 1:2 (1 in. = 2 in.).

- The second step consists of connecting the highest and lowest electrode points and finding along the contact line a horizontal projection of a point which has the same elevation as the third point.

There are different methods which can be applied in finding the horizontal projection of a point having the same elevation as the other one. The simple geometrical method of dividing a line into any desired proportion was applied in this example. This can be reworded thusly: the length of the contact line corresponds to the vertical displacement between the two points it connects. In order to find the length which will correspond to the vertical displacement of the third point, having chosen a convenient scale, draw a line with an arbitrary angle from point No. 1; measure off on this line a distance equivalent to the displacement difference between the interconnected points of the adjacent line to obtain point B′. Connect the scaled interval with point B on the original line to obtain BB′. Draw a parallel to this line from point C′ to intersect with point C. Point C′ is the equivalent length representing the elevation difference between points No. 1 and No. 3. Point C is the horizontal projection of a point having the same elevation as point No. 3.

- The third step consists of connecting points No. 3 and C. This line is the uncorrected strike line of the plane in question; it is perpenticular

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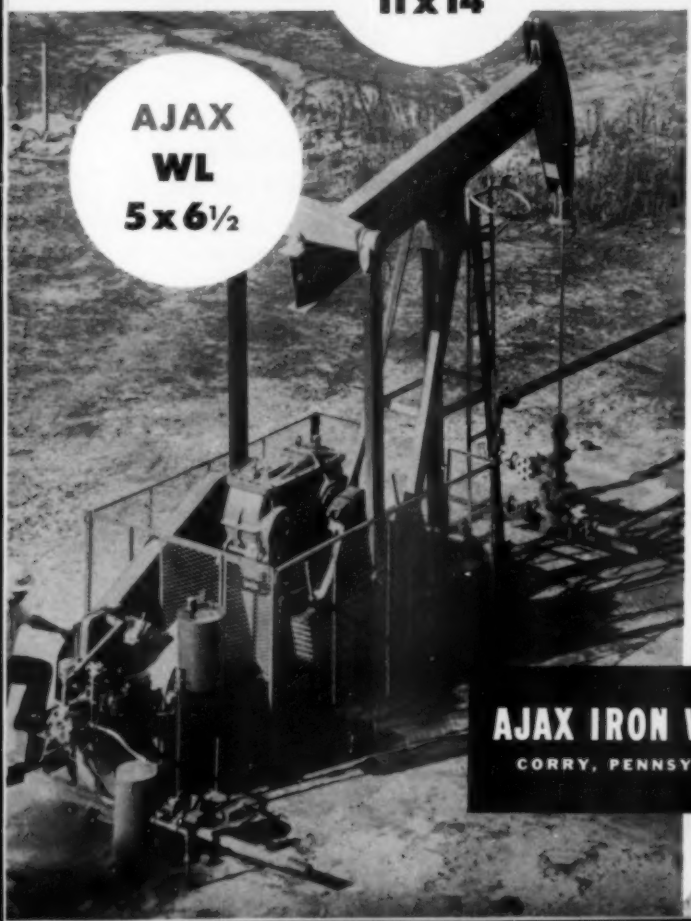

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Here J. R. Phillips' HD-11 digs a slush pit. Tractor develops 94 belt hp, weighs 24,800 lb (as illustrated).

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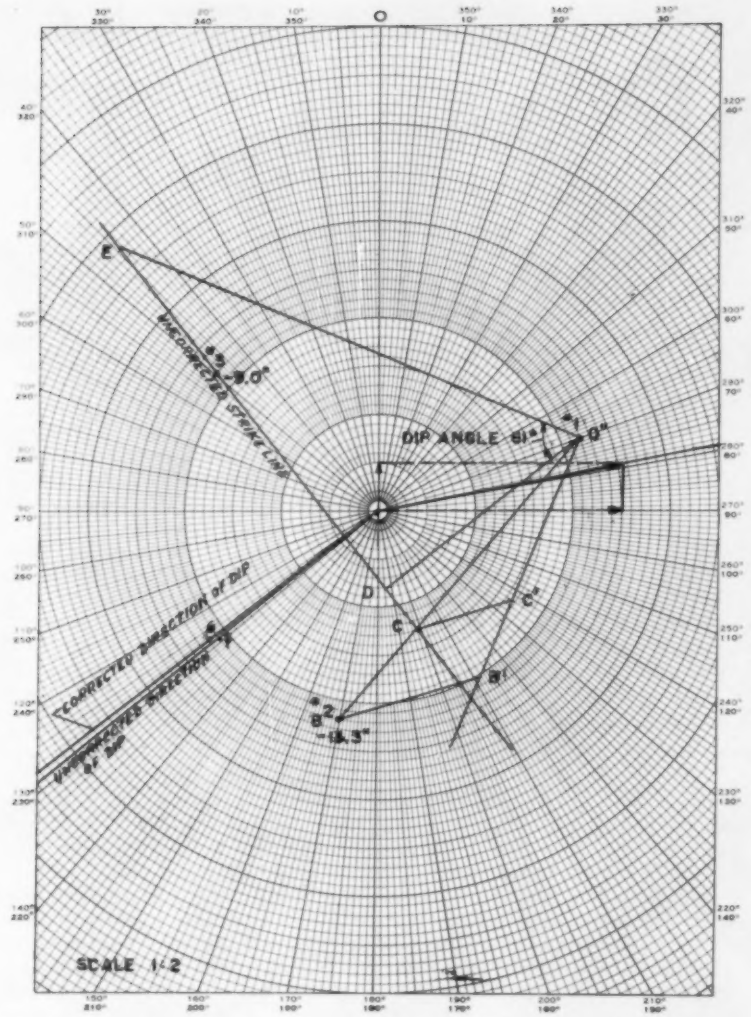

Fig. 5—The apparent dip and strike are calculated graphically on polar coordinate paper. See Steps 1-5 in the text.

to the uncorrected direction of the dip.

● The fourth step consists of drawing a perpendicular line to the uncorrected strike line from a point whose distance is greatest from the strike line or line No. 1D. Scale along the strike line from point D the different elevations between the point of origin (point No. 1 in this case) and the strike line in accordance with the horizontal scale to obtain point E. Connect point E with point No. 1. The angle D No. 1 E which is close to point No. 1 is the uncorrected dip angle of the plane in question. And when measured with a protractor, it equals 61°, in our case. The angle of dip could have been determined by taking the arc-tangent of 9.0/5.0 which equals to 60° 58′ or approximately 61°. The Figure "5.0" is the distance in inches from point No. 1 to the strike line along a perpendicular line, while "9.0" is the difference in elevation expressed in inches between the two points represented by the length of line DE.

● The fifth step consists of drawing a line perpendicular to the strike line through the center of the polar coordinate paper always in the down-dip direction. This line represents the uncorrected direction of dip. Its azimuth from the magnetic north can be read directly from the polar coordinate graph paper. In this case the azimuth equals 231°. The values of the uncorrected dip and the uncorrected azimuth of dip should now be corrected for the hole inclination if the hole is not vertical. If, however, the hole is vertical, the uncorrected dip and its uncorrected direction are equal to true values.

All the above graphically solved steps can be easily repeated with an arithmetic solution consisting of two formulas.[1] In order to assure the greatest accuracy, it is strongly recommended that the computations of uncorrected dip and its direction of each marker bed (plane) be performed using both methods.

The following are the two formulas used in computing the dip and its direction not corrected for any hole drift effect. The derivation of these formulas will not be discussed in this paper. They are:

$$\tan \alpha = 2\,(h_2^2 - h_2h_1 + h_1^2)^{1/2}/3r \quad (1)$$

$$\tan \beta = 1.732 \times \frac{h_2 - h_1}{h_2 + h_1} \quad (2)$$

Where:

α = uncorrected angle of dip.

β = the azimuth angle of the electrode where the anomalous point is the lowest or in other words, the clockwise angle between the direction of the lowest point and the direction of uncorrected dip. In order to obtain the direction of uncorrected dip add to angle β the azimuth angle of the electrode whose elevation is the lowest.

r = hole radius.

h_1 = the difference in actual elevation expressed in inches between the lowest point and a corresponding point on the curve following in cyclic permutation—1, 2, 3, 1—.

h_2 = the difference in actual elevation expressed in inches between the lowest point and a corresponding point on the remaining curve.

By applying the same data used in the graphical solution the two independent results can be compared:

$$r = 4.4 \text{ in.}$$

$$h_1 = 13.3 - 9.0 = 4.3 \text{ in.}$$

$$h_2 = 13.3 - 0 = 13.3 \text{ in.}$$

$$\tan \alpha = \frac{2}{3 \times 4.4}\,[(13.3)^2 - 13.3 \times 4.3 + (4.3)^2]^{1/2} = 1.814$$

$$\tan \beta = 1.732 \times \frac{13.3 - 4.3}{13.3 + 4.3}$$

$$= 0.886$$

$$\alpha = 61° 8'$$

$$\beta = 41° 32'$$

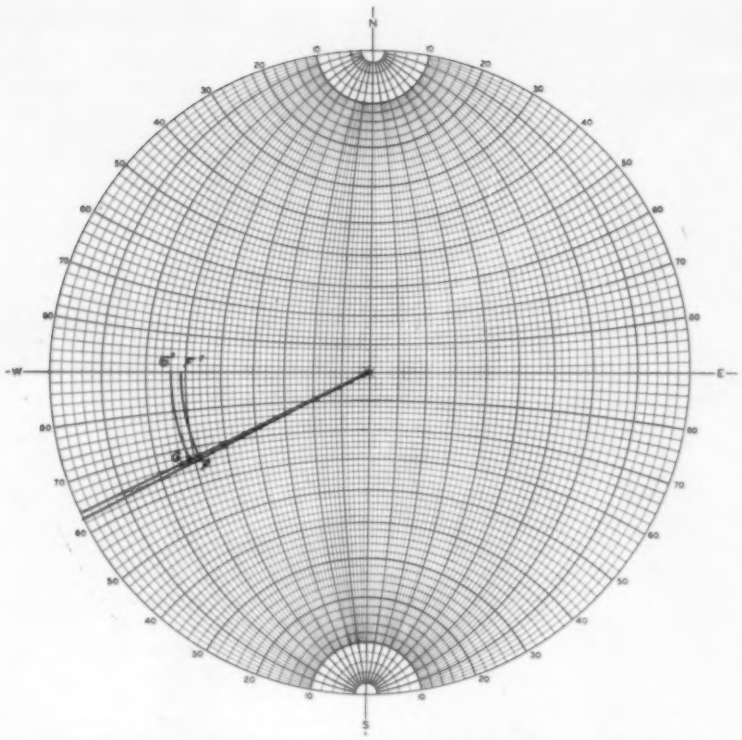

Fig. 6—Steps 6-10 are worked out on the stereographic net. The final result gives the true dip and strike of the bed.

The azimuth of the direction of the uncorrected dip would then be equal to 190° + 41° 32′ = 231° 32′. The mathematically obtained results are in complete agreement with those obtained graphically.

Caution should be exercised in determining the decimal point when using the mathematical computations. Assume that a mistake has been made in decimal points and tan α = 18.14 and tan β = 8.86. Then α would be equal to 86° 51′ and β 83° 34′, and the azimuth of the direction of the uncorrected dip would be equal to 273° 34′. A simple error can similarly be made in the graphical solution. Thus, one computational method always should be checked by the other. It is much cheaper to do several minutes of additional work than to justify a dry hole.

If the hole is not vertical, and a certain amount of drift is present, the uncorrected dip and its direction must be converted to true values. This may be done either with the aid of vector analysis or through vectorial solution using a stereographic net projection.

● Thus the next step, which is the sixth in graphical solution, is to determine the azimuth from the magnetic north of the bore-hole inclination, as well as the magnitude of inclination. This may be done by adding vectorially two components of the bore-hole inclination which are recorded by the teleclinometer on the left portion of the TDM continuous MicroLog dipmeter log. These components are recorded in either north-south or east-west direction, Fig. 2. The scale used in solving these components may be chosen arbitrarily. In the example in Fig. 5, we used a scale where 1° = 1 in. The length of the resultant vector measured with the chosen scale equals the magnitude of the hole inclination. The bearing of the resultant vector is the azimuth of hole inclination. The dashed arrowed lines in Fig. 5 are the bore-hole inclination vectors. Their resultant (heavier solid line) has a magnitude of 2.55°, this is the angle of hole drift or hole inclination. The azimuth of hole drift in our case equals 79°.

In the newest continuous poteclinometer type of dipmeter, designated as CDM (continuous dipmeter) the magnitude of hole inclination in degrees is recorded directly on a curve on the left portion of the dipmeter log. The azimuth of hole inclination is determined by measuring always from left to right the number of divisions from the relative bearing curve to the azimuth curve of the No. 1 electrode and multiplying them by 40. Fig. 3 (Part 1) shows a portion of a CDM log. In this figure the magnitude and the azimuth of hole inclination are read off directly from corresponding curves by following an appropriate scale down to a desired point.

In the older noncontinuous, resistivity of S.P.-type dipmeters, the photoclinometer record indicates directly the magnitude and azimuth of hole inclination at every level recorded. In any level where a noncontinuous section, usually 30 or 50 ft., is recorded, the photoclinometer data are available at a depth corresponding to the bottom and top of this section and frequently also in the middle. Therefore, it is necessary to either average or interpolate the magnitude and azimuth of hole inclination when computing a given marker within the level. Similarly, the azimuth of the No. 1 electrode is either averaged or interpolated. All the rest of the necessary steps in computing the true dip and its direction from a noncontinuous dipmeter are precisely the same as those in a continuous type of dipmeter.

All the following steps will be taken in conjunction with a stereographic net, Fig. 6. In order to understand the use and application of a stereographic net in correcting a computed dip of a bed and its direction for a bore-hole inclination affect, we shall analyze a relatively simple example.

Let us assume a nonvertical bore hole with a drift angle of 5° and an azimuth of drift equal to 90°. The azimuth of the uncorrected dip direction of bed EF is 270°, and the amount of uncorrected dip is 20°. These conditions are represented in a vertical cross-section in Fig. 7. Measurement of a vertical displacement was taken with respect to the bore-hole axis A′B′. Therefore, the results are with respect to the A′B′, C′D′ coordinates. Since it is desired to have the final results with respect to vertical and horizontal coordinates, it is necessary to convert the data from the A′B′, C′D′ coordinate system to a vertical and horizontal AB, CD coordinate system. By doing so, we would be correcting for the bore-hole inclination.

In our simplified example, in order for the A′B′, C′D′ coordinates to be rotated into the AB, CD coordinates, it is necessary to add the bore-hole inclination angle to the magnitude of uncorrected dip and thus obtain the true dip angle.

If the azimuth of the uncorrected dip direction of bed GH is 90°, it is rather obvious why it is necessary to subtract the bore-hole-inclination angle from the uncorrected dip angle to obtain the true dip magnitude. In our example, the azimuth of the dip direction and the azimuth of the bore-hole inclination were 180° apart in

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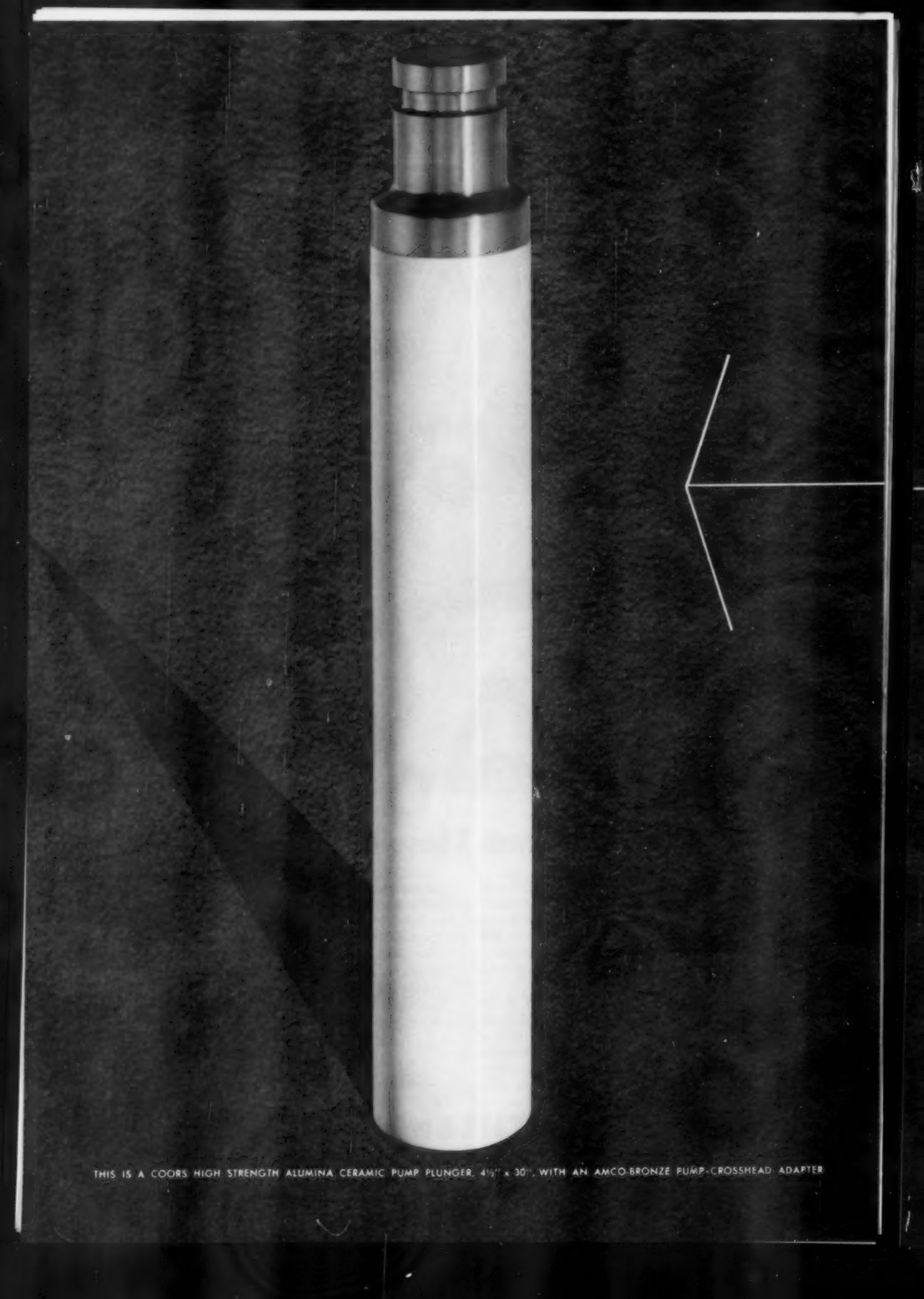

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Hardness	Moh's Scale	9
Maximum Working Temperature	°F	2550
Closest Machined Tolerances	inches	0.000020

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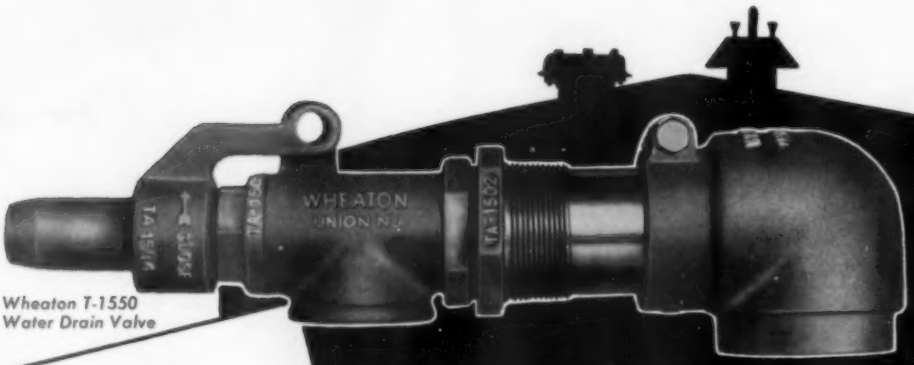

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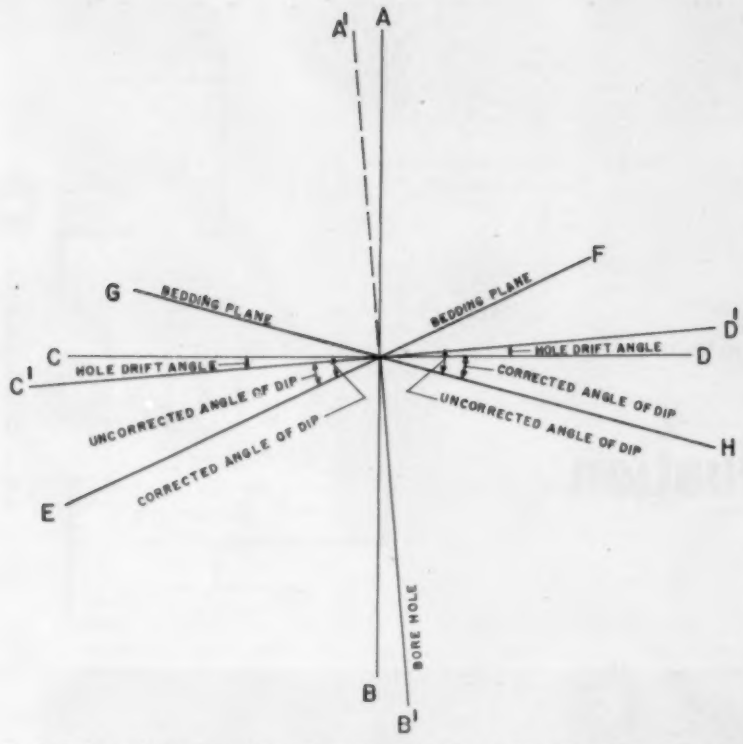


Fig. 7—This vertical cross-section shows the principle of bore-hole drift correction.

the first case; they were along the same line in the second case.

Thus, the bore-hole inclination could be added to obtain the magnitude of the true dip, while the azimuth of the dip direction remained unchanged. If the azimuth of hole drift and the direction of dip are not along the same line or 180° apart, the same procedure as in the above example may be applied with this exception: The addition or subtraction of the bore-hole-inclination angle is performed with the aid of a stereographic net where the direction and magnitude of a bed's dip and the azimuth and magnitude of the hole drift are brought into account on the three-dimensional basis.

● In the seventh step we overlay the polar coordinate paper on a stereographic net, Fig. 6. Be sure the centers of the two sheets coincide. Subsequently, the polar coorindate paper is rotated until the uncorrected down-dip direction coincides with the stereographic net's east-west line. Then the magnitude of uncorrected dip is scaled, using the stereographic net's scale to obtain point F. In the stereographic net the smallest division equals 2°.

● The eighth step consists of rotating the polar coordinate paper until the bore-hole-inclination resultant vector, representing the hole-drift direction, will coincide with the stereographic net's east-west line. From point F, scale along a small circle (almost horizontally) on the stereographic net, the magnitude of bore-hole drift angle, always in the opposite direction from the bore-hole drift to obtain point G.

● The ninth step consists of finding the magnitude of true dip by rotating the polar coordinate paper until point G coincides with the stereographic net's east-west line. Next, scale off the degrees from the center of the net to point G, to obtain the magnitude of the corrected or true dip angle. In our example the true dip angle equals 64°. The magnitude represented by points F and G did not have to be determined by rotation and scaling off, but could have been determined with the aid of projection of proper magnitudes to points F' and G' as indicated in Fig. 6.

From the above step, it is seen that a vectorial addition took place between a vector quantity representing the uncorrected dip angle and a vector quantity representing the angle of bore-hole inclination. As previously described and indicated in Fig. 7, a subtraction as well as an addition may take place. This depends upon the quadrant in which the direction of uncorrected dip is present and its relative position to the azimuth of hole inclination. You should not be concerned about attempting to determine whether an addition or subtraction will take place, but you should follow the above described rule of scaling off the magnitude of hole inclination along a small circle from point F, always in the opposite direction from the hole drift to obtain point G.

● The tenth step consists of finding the azimuth of the corrected dip, direction by connecting point G with the center of the polar coordinate paper. The true direction of dip may be read off directly by extending the line to the edge of the polar coordinate paper. In this example the azimuth of the direction of dip equals 232° or the direction of dip is S 52° W.

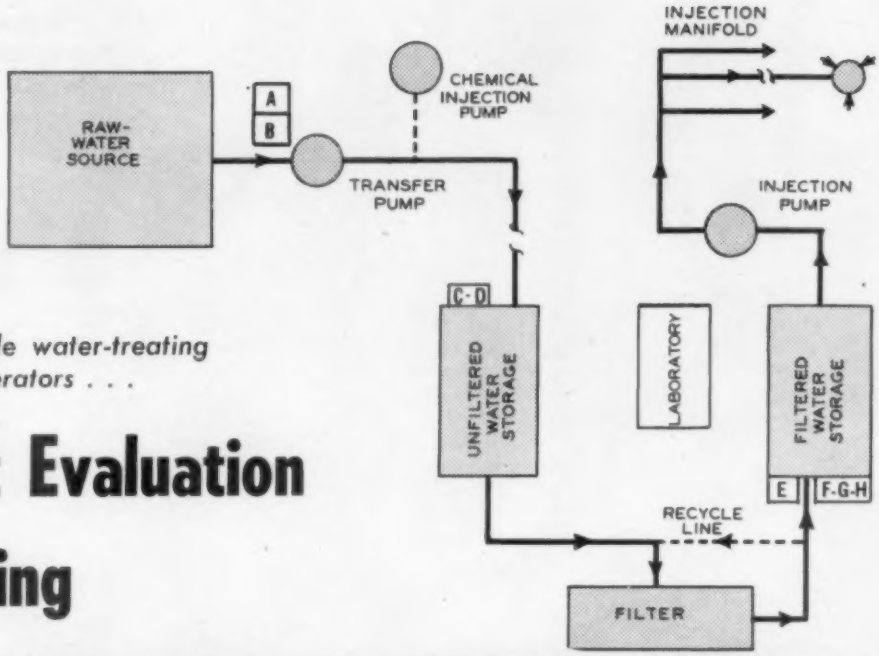
The azimuth of dip direction and the dip direction are from magnetic north. Therefore they should be corrected for magnetic declination. This varies with the area in question. It is possible to obtain a table or a map indicating the variation of magnetic declinations throughout the United States as well as throughout foreign countries. When in doubt, call the U. S. Coast and Geodetic or U. S. Geological Survey, or the U. S. Weather Bureau to inquire about the magnetic declination in the area of interest. If the magnetic declination is toward northeast it is always added to the azimuth or bearing from magnetic north to obtain the azimuth from a geographic north. If the magnetic declination is toward northwest, it is always subtracted. If the magnetic declination in the area is N 14° E, then using this example, the azimuth from geographic north would be 246° and the bearing from geographic north would be S 66° W. **End.**

"If the magnetic declination is toward northeast it is always added to the azimuth or bearing from magnetic north to obtain the azimuth from a geographic north. If the magnetic declination is toward northwest, it is always subtracted."

Correction

The captions in Figs. 8 and 9 of the article, "Can Oil Be Found by Direct Means," page 109, April 1 issue, stated that the operator failed to establish commercial production and the well was abandoned. Actually, this well is in process of being completed, and the author believes that a commercial producer will result.

SCHEMATIC flow diagram of portable water-treating and injection plant Shell is using at Ventura. Automatic controls used are lettered and are explained in the test.



Completely portable water-treating plant provides operators . . .

Low-Cost Evaluation Of Flooding

THE ENTIRE treating and filtering plant can be moved in four truck loads. The raw-water tank is at right, then the laboratory, and the filtered-water tank.

by D. H. Stormont
District Editor

A PORTABLE water-treating plant designed by Shell Oil Co. engineers will permit the company to evaluate water-flooding feasibility of various California pools at a minimum cost.

The completely skid-mounted plant is now in operation at a small flood in Ventura field. Whenever it is desired to move the 5,000-bbl.-daily-capacity plant from its present location only the concrete pads will be left behind.

By preparing the site in advance it is expected the plant could be in operation at another field within 3 days after dismantling is started. It moves in four truck loads, exclusive of piping to the raw-water source and to the injection wells.

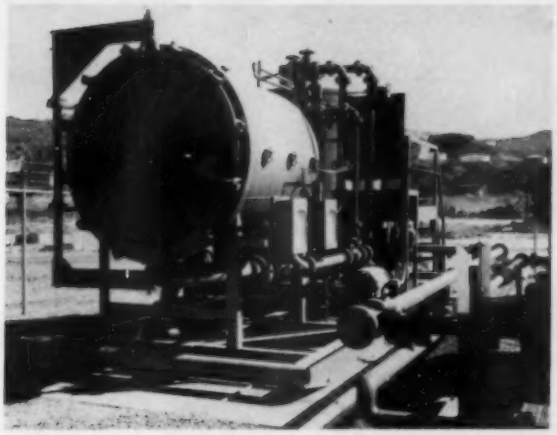
The accompanying schematic diagram shows the flow of water through the plant. How the principal components, including a complete field laboratory for microbiological and chemical control, have been unitized into five skid loads is shown in accompanying photographs.

The facilities include a 10-hp. centrifugal raw-water pump, two 180-bbl. tanks for unfiltered and filtered-water storage, a 300-sq.-ft. pressure leaf filter, and a 40-hp. centrifugal injection pump. Controls for maintaining a gas blanket inside the two tanks are mounted on the tank skids.

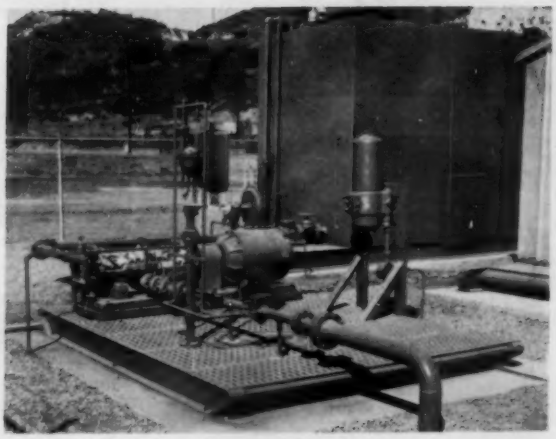
Automatic controls . . . Except for manual controls used in backwashing the diatomaceous-earth filter, operation of the plant is entirely automatic. These controls, indicated by letters on the flow diagram, include:

. . . Transfer pump: A timer starter (A) starts the pump at regular inter-

PRODUCING



THE PRESSURE leaf-type filter, slurry and back-wash tank, and all piping are unitized into a single skid load.



FILTERED WATER is supplied to injection wells by 5,000-bbl. per day centrifugal. Controls at wellheads maintain desired injection rate.

vals in accordance with the volume of water to be injected. Pressure switch (B) shuts down the pump when the raw-water tank fill line is closed by high water level.

... **Unfiltered-water tank:** When the tank becomes nearly full, a water-level high-level control (C) closes the inlet valve. When the water level drops too low a low-level control (D) causes the filter to recycle.

... **Filtered-water tank:** Float control (E) operates to maintain the water level near the top of the tank. If the injection pump stops, the water level in the tank rises until a high-level control (F) causes the filter to recycle. Low-level control (G) shuts down the injection pump when insufficient water is available.

... **Injection pump** is a two-stage centrifugal capable of delivering 5,000 bbl. of water per day at a discharge pressure of 200 psi. A starting control (H) automatically starts up the pump when the filtered water tank is two-thirds full.

... **Wellhead controls** at each injection well maintain the desired injection rate regardless of line pressure variations. The system consists of a proportional band controller and a diaphragm-operated needle valve. Injection pressures and flow volumes are recorded.

Chemical treatment ... In the current flooding operation, raw water from a central skimming pit is delivered to the filter plant through 3,300 ft. of uncoated steel pipe. Although the raw water has been exposed to air, microbiological life and organic matter in the water reduce the oxygen content to 0 p.p.m.

Rendering the water suitable for injection presents a rather difficult treating problem. Undissolved solids content averages over 100 p.p.m. and active colonies of sulfate-reducing bacteria are present. Iron sulfide and the bacteria offer the most troublesome constituents. Not only is iron sulfide an effective sand-plugging agent, but also the sulfate-reducing bacteria cause the formation of iron sulfide as a product of their existence.

Chemical treatment used consists of injecting Duomeen C, a cationic corrosion inhibitor and a bactericide. This chemical, plus the effective filtration obtained in the diatomaceous-earth filter, results in a bacteria-free water having practically no undissolved solids.

Day-by-day examination of the water in the field laboratory provides the necessary control over the quality of the injection water. In addition to the Millipore filter test, routine examinations include tests for oxygen, iron, sulfide, and bacteria.

Quality of the filtered water is determined to a great extent by the Millipore filter test. In this method all solid particles are retained on the thin cellulose acetate filter and reduce its flow capacity. A plot of the flow rate versus volume throughput yields a qualitative measurement of water's plugging tendencies. **End.**

AUTOMATIC CONTROLS on the filtered water tank include the float control and high and low-level controls. Other controls maintain a gas blanket over the surface of the water.

SKID-MOUNTED field laboratory is equipped for carrying out Millipore filter tests, as well as for oxygen, iron, sulfide, and bacteria.

BIG BARGE RIG has a capacity of 750,000 lb. static hook load.

CASING RUNNING took 12 hours. Weight in air of the 15,400 ft. of 9⅝-in. casing was nearly 720,000 lb

Record 9⅝-In. Casing String Goes 15,400 Ft.

THE longest string of 9⅝-in. casing ever run has been set by W. T. Burton Industries, Inc. Burton 1 State Lease 2833 set a single unbroken string of 9⅝-in. to 15,400 ft. Rack weight of 719,000 lb. also made the string the heaviest ever run out of a mast.

The well, in Lake Palourde near Morgan City, La., was drilled by one of Burton's own submersible drilling barges. The barge is equipped with an Ideco 143-ft. Full-View mast and a Brewster N-12 rig. With 12 lines strung, the mast has a maximum rated static hook-load capacity of 750,000 lb. and nominal gross column capacity of 940,000 lb.

Total time in setting the record string, from beginning to end, was 28 hours. This includes 8 hours laying down drill pipe, 1 hour breaking out drill collars, and 12 hours running casing. Before the pipe was run, 7 hours were spent rerigging and replacing the rotary. A six-man crew using power tongs ran the string.

During the running, 100,000 lb. was lost in the first 4,000 ft. With the last 4,000 ft. floated in, highest indicator weight of casing in the hole was 490,000 lb. With the string on bottom, it took 1 hour and 45 minutes to fill the last 4,000 ft. with mud.

Cements without hitch . . . Contractor on the project was Grady Roper Drilling Co. of Sulphur, La. Roper reported the mud was in good enough shape before and during running that it was never necessary to bypass the shale shaker.

With the casing string on bottom, the pumps broke circulation with only 750 psi. The hole was circulated with 500 to 700 psi. for 3 hours before cementing. Neither while circulating mud nor while displacing cement was there any loss of circulation.

Halliburton mixed 2,500 sacks of pozzolanic cement in 1 hour and 10 minutes; pumping the cement took 1 hour and 30 minutes. **End.**

DRILLING

Heavy String Makeup

9⅝-IN. STRING, BROKEN DOWN

No.	Item	Footage	Weight, lb.
2	Baker float collars and guides	5.18	277.13
118	Joints 9⅝-in. o.d. casing at 47-lb. N-80 L.T.&C.	4,039.06	192,030.72
155	Joints 9⅝-in. o.d. casing at 43.5-lb. N-80 L.T.&C.	6,036.90	265,273.87
22	Joints 9⅝-in. o.d. casing at 47-lb. N-80 L.T.&C.	693.36	32,996.82
24	Joints 9⅝-in. o.d. casing at 53.5-lb. N-80 L.T.&C.	950.79	50,895.37
41	Joints 9⅝-in. o.d. casing at 43.5-lb. N-80 int. jt. hardened end	1,686.80	73,877.36
14	Joints 9⅝-in. o.d. casing at 47-lb. N-80 int. jt. hardened end	574.79	27,200.31
34	Joints 9⅝-in. o.d. casing at 53.5-lb. N-80 int. jt. hardened end	1,433.00	77,176.96
	Total	15,419.28	719,728.54

MUD PROPERTIES AT TIME CASING SET

Mud weight, lb. per gal.	13.5
Funnel viscosity, sec.	48
Stormer viscosity, cp.	59
Gel strength, g.	0-0
pH	12.5+
Water loss, cc.	1.6
Mud cake, in.	1/32
P alkalinity filtrate, cc.	8.0
Chloride, p.p.m.	1,600
P alkalinity mud, cc.	49.0
Solids content, vol. per cent	24½
Oil content, vol. per cent	10½
Lime content, lb. per bbl.	11.0
Graphite content, lb. per bbl.	4.0

by H. G. Bentson
H. C. Smith Oil Tool Co.

ROCK-BIT DESIGN, SELECTION, AND EVALUATION — End of Series

Use This Table to Choose Proper Bits

CONDITION OF DULL BIT	POSSIBLE CAUSES	POSSIBLE REMEDIES
EXCESSIVE BEARING WEAR	Excessive rotary speed Excessive rotating time Excessive weight on bit Excessive sand in circulating fluid Unstabilized drill collars Improper bit type	Slower rotary speed Reduced rotating hours Lighter weight on bit Removal of sand from circulating fluid Stabilize drill collars Use of harder formation bit type having larger bearing structure
EXCESSIVE BROKEN TEETH	Improper bit type Improper "break-in" procedure used for new bit Excessive weight on bit for type used	Use of harder formation bit type having greater number of teeth Proper "break-in" procedure for new bit Lighter weight on bit
UNBALANCED TOOTH WEAR	Improper bit type Improper "break-in" procedure used for new bit resulting in broken teeth which appear to be worn when bit is pulled	Use of different bit type based upon the rows of teeth which are excessively worn on the dull bit Proper "break-in" procedures for new bit
EXCESSIVE TOOTH WEAR	Excessive rotary speed Improper bit type Use of non-hardfaced type	Slower rotary speed Use of harder formation bit having greater number of teeth Use of bit type having hardfaced teeth
EXCESSIVE CUPPING OF TOOTH CRESTS	Double hardfaced teeth Insufficient weight for adequate penetration Improper formation for double hardfaced teeth	Use of bit with single face hardfacing or single face and "tipped" hardfacing Heavier weight on bit
BRADDING OF TEETH	Excessive bit weight on dull bit Formation too hard for bit type used	Replace bits after less rotating time Use of harder formation bit having greater number of teeth
FLUID CUT TEETH & CONE	Excessive circulation rate of fluid Excessive sand in circulating fluid	Reduction in circulation fluid rate Removal of sand from circulating fluid Use of jet circulation bit
EXCESSIVELY UNDERGAGE	Improper bit type Excessive rotating time	Use of bit type having greater gage protection Reduced rotating hours
SKIDDED DUE TO BALLING	Excessive weight on bit Improper bit type Insufficient fluid circulation rate	Lighter weight on bit Use of softer formation bit type having teeth more widely spaced Increased fluid circulation rate

Note: The table is primarily intended to indicate the importance of evaluating the condition of dull bits in relation to improved selection and performance. As such, it should not be construed as being entirely complete.

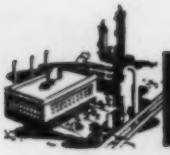
SUMMATION of factors relating to dull-bit evaluation which are important for improved bit selection and performance. **Fig. 41.**

THIS series of articles, which started July 23, 1956, has established that important dissimilarities exist among bit types even though their basic geometry may be similar.

Each bit type is designed for a specific purpose. Its drilling characteristics are determined by a combination of design factors, each of which may be varied to perform an individual function.

Because of extensive differences in formations and drilling techniques, it is essential to have a basic understanding of these design factors and their variations in relation to each of the bit types. With this knowledge, more effective selection and evaluation should result. Dull bits can tell a lot about improper drilling conditions. Use the above chart as a key to bit selection and proper drilling practices. It will help you evaluate causes of bit dulling. **End.**

Heat Transfer
Part 12



JOB IMPROVEMENT FOR THE PROCESS FOREMAN—86

Draft Control Affects Furnace Efficiency

GAS comes in through the center pipe (see Fig. 11, the Foreman's Page, April 15) with enough velocity to aspirate, or suck, air in through the opening above an adjustable shutter. The amount of air sucked in is controlled by the size opening above this primary shutter.

Air sucked through the primary shutter mixes with fuel gas in a mixing chamber on the way to the burner portholes. This is typical of a premix burner. The intimate mixing of air and hydrocarbons before the burning zone is reached improves combustion. Therefore it is a desirable feature of a burner. All of the air needed to support combustion cannot be supplied in this premixing section. The rest of the air needed is pushed by natural draft through a secondary adjustable shutter.

Draft . . . The draft at any location within a furnace, breeching, or stack is the difference between the pressure at that location and the pressure of the atmospheric air on the outside.

This draft, or difference of pressure, is caused by the difference between the weight of the vertical column of hot flue gases in the furnace and stack, and the weight of a column of cooler outside air of the same height. The cooler outside air column is heavier. As it contacts the air openings around the furnace burners its greater weight causes it to rush through these openings and push the lighter, hotter flue gases up the stack. The cool air is heated instantly in the furnace then it, in turn, is pushed up the stack by more cool, heavier air. In this manner the movement of cool oxygen containing air through the furnace becomes continuous.

The control of this natural draft or flow of air must be accomplished by some mechanical means of obstructing the movement of air up the stack. This is done by a damper placed in either the breeching or stack. It operates in principle just like the damper on an old style wood or coal cook stove. Remember that if it were closed too tight, smoke backed into the room and the fire finally went out. If it were opened to wide the beans burned. So it is with the damper on a refinery furnace; there must be an in-between point for best operation.

To best determine the proper damper setting, draft gages have been connected to the following locations at each furnace:

1. One in the breeching between the main damper and the firebox.
2. One in the ceiling of the firebox.

From the reading of the draft gage connected to the breeching and occasional Orsat analysis of the flue gas by tester engineers, an operator can soon obtain a backlog of information that will enable him to determine the best damper settings for any operating conditions. This would require keeping records of transferline temperature, oil inlet temperature, charge rate, charge stock, and damper settings each time a check is made of furnace combustion. Such records would be invaluable in determining future damper settings when similar operating conditions are encountered.

From the reading of draft gages to the one or more firebox ceilings of a furnace, the following can be determined:

1. If there is positive pressure instead of desirable draft at the firebox ceiling.
2. If the drafts in different fireboxes exhausting through the same breeching damper are properly balanced.

If a positive pressure is indicated it should be corrected immediately by further opening of the main damper until the desired negative pressure or draft is obtained.

Natural draft is affected by sharp changes of temperature or barometric pressure of the outside air. As the temperature of air becomes colder it becomes heavier, forcing more of the light hot air up the stack. As barometric pressure increases the same thing happens, but to a lesser degree. In both cases, circulation of air, or draft, is increased and adjustments must be made accordingly. Proper control of draft in a furnace is essential to good operation.

Flame impingement and afterburning . . . Flame impingement refers to the burner flames touching the tubes and wall of the furnace. In any heater the length of the flame in the combustion zone is of importance. Generally, the flame should be as short as possible to give uniform furnace temperature and prevent impingement of the flame on any part of the heater tubes or walls.

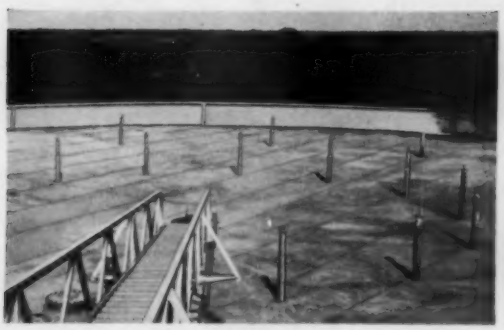
Flames that reach the furnace wall cause rapid deterioration with increased operating and maintenance costs. Impingement on the tubes causes local overheating of the oil flowing through the tubes with decomposition and coke formation inside of the tubes. Also, scaling of the exterior surface of the tube may lead to mechanical failure of the tube wall. This places emphasis on the value of periodic inspection of the firebox.

Afterburning is the delayed combustion of air and fuel gas in the upper parts of the furnace. Not very common in the gas-fired process-unit furnaces, nevertheless, afterburning can occur in furnaces operated in excess of design capacity. The furnace most likely to experience afterburning is the updraft type with the stack in the firebox roof. Afterburning will cause damage to the walls, tubes, and stack.

Heat transfer has been defined as the movement of heat from its source into anything that is colder. In a refinery furnace, the flames of the burners are the source of heat. Heat moves from the flames into the oil flowing through the furnace tubes.

The means of transferring heat by radiation, convection, and conduction has been discussed earlier in this section. In the furnace all of these means are employed.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.



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5618

by J. L. Cottrell

REGULATORS, METERS, AND INTEGRATORS

Part 2

How to Use Bellows Type of Orifice Meters

RECENT data published in the A.G.A. report No. 3, would tend to indicate that flange connections are more desirable under most operating conditions which simplifies installation, housing, length of manifold pipe, and other factors. The Beta ratio or line size to orifice size should be kept within the recommended tolerance of the report. A good rule to follow on a 4-in. meter run would be, never to use an orifice smaller than ½ in. or larger than 2½ in. However, A.G.A. report No. 3 limits the maximum orifice size to 2¾ in.

Below ½ in. the coefficients are not considered too accurate, and from the standpoint of operation, the small orifice will be affected by liquid, dirt, and other substances, which may decrease the size of the orifice. Dirt building on the approach of the plate, forming a venturi effect, will give a low reading, and anything decreasing the size of the orifice will give a high reading.

Meter-run design should be in accordance with A.G.A. specifications and the pipe should project through the flange and flush with the edge of the flange. This eliminates a recess directly upstream or downstream from the orifice. Screw type of orifice flanges should be a thing of the past. One-half-inch connections are desirable on the bottom side of the flange for bleeding liquid out of the run. Where a constant amount of liquid is passing through the orifice some companies drill a weep hole on the bottom side of the orifice. This allows the liquid to drain through constantly. It will not build up on the face side of the plate or go through in slugs.

Orifice fittings are desirable for ease of inspecting and changing orifice plates. Many an orifice plate inspection has been boiler-housed because the flange is located in a pit or because of rusty bolts and lack of energy by the meterman.

The author is with Flow Measurement Co., Inc., Tulsa. Paper presented at the N.G.A.A. regional meeting at Shreveport, La.

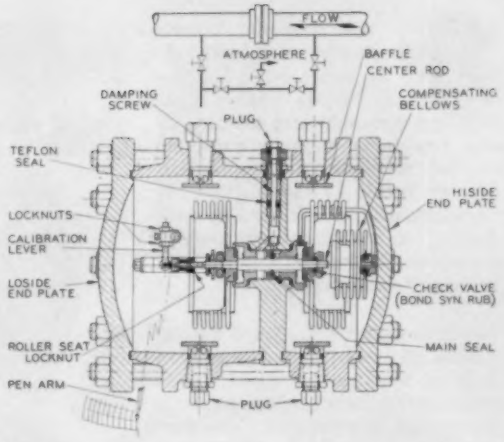
Dampening meters. All mercury meters are dampened to some extent by the area of the U-tube from the high side to the low side of the meter. Dampeners provided by the manufacturer should be operated with care so that the flow of mercury will not be shut off from one side to the other. They should only be dampened enough to obtain a readable line. Overdampening will tend to make the differential pen ride high on zero, because of contamination of the mercury. There is less float power when the differential pen approaches the zero position.

The stuffing box on an orifice meter measuring casing-head gas usually requires more care than on orifice meters measuring transmission gas. This is due to the extreme fluctuation of the differential pen. Teflon bearings, used in stuffing boxes by many manufacturers greatly improve performance and reduce maintenance of an orifice meter.

The bellows type of orifice meter is being used more generally. Like anything else new on the market, the customer always puts the new product on his toughest job, and the bellows meter is no exception. We read thousands of charts each month from all sections of the country, in which the talents of the operator vary quite widely. It would appear that the bellows meter gives a good chart and zeros more closely under adverse conditions than the mercury type of meter.

The differential range on the bellows meter can be changed with ease and at far less cost than the mercury type. Where you can use 7-day charts, the 8-day chart is more desirable and will save 20 per cent in operating costs. Also available are 14, 15, 30, and 31-day charts and clocks. However, don't be in a position of guessing at the reading by using 8, 15, and 31-day charts just to cut down on the cost of charts, integration, and field changing time unless you can read a readable chart. If it is impossible to read a 24-hour chart, a fast clock can be installed. Either 15-minute, 1-hour, 2-hour, or something under the 24-hour rotation is recommended to study the characteristics of flow. It would not be good practice to have a 15-minute chart to assume what happened in the 15-minute period would be an average condition for 24 hours.

Tank type or siphon type pens are desirable on 24-hour charts where the differential travels from zero to the upper limit, 8 to 10 times within an hour. They are a must on charts that run a week or more. You don't have an 8-day chart as far as the record is concerned, unless the pressure and differential pens are writing clear around the chart.



BELLOWS METER—Differential type of meter uses stainless steel or monel bellows.

Part 7

REFINER'S NOTEBOOK

Corrosion of Ferrous-Metal Tubing

Mechanical Factors Influence Corrosion

by Thomas M. Krebs

MOLTEN salts may slag protective films or produce other effects such as increasing carburization potential. Tubing or other structural members subjected to firing by oils containing a high vanadium content may also suffer local or general attack from slagging by vanadium pentoxide formed by combustion if operating temperatures are above the melting point of this compound, about 1,250° F.

Mechanical factors . . . The influence of mechanical factors in corrosion is frequently overlooked. The term mechanical-chemical corrosion is intended to extend to those cases in which metal deterioration results from the combined effects of mechanical and chemical actions. Refinery materials are subject to such conditions as for example—erosion-corrosion or stress-corrosion cracking. To some extent this form of attack ties in closely with certain of those previously discussed.

Similarities and overlapping with the forms mentioned earlier exist but these are to be expected in corrosion study and the mechanical-chemical effects are worthy of separate consideration. In refinery service the mechanical factor is frequently thermal strains resulting from cyclic elevated-temperature operating conditions or shutdowns.

The simplest case is the spalling of tube scale on heating or cooling followed by accelerated attack of the freshly exposed surface. This happens constantly in heater tubing and little thought is given to it but the mechanical factor is present.

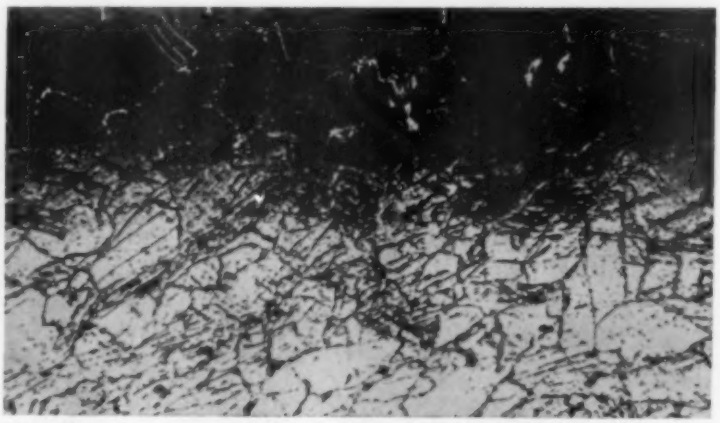
A pertinent case was observed several years ago in a carbon-steel tube which had fins over a portion of its length and served in a phenol evaporator in a Duo Sol plant (Fig. 14).

Spalling and flaking of corrosion products occurred coincident with the beginning of the fins where the thermal gradients and thermal strains were highest. In this case the use of a low chromium steel which forms a more adherent corrosion layer and modification of the fins was recommended to the operator. A somewhat similar case is shown in Fig. 15 which shows how thermal strains from temperature differences caused spalling of the carburized case (Fig. 16) of a Type 304 tube in ethylene cracking service. Carburization, of course, may be pictured as a chemical attack in the form of penetration by carbonaceous material which leads to deterioration of the properties of the metal for many services. The action of hydrogen may be classed in the same category.

Author is metallurgist, Tubular Products Division, Babcock & Wilcox Co. Article presented at Western Petroleum Refiners Association meeting, Wichita.

ACCELERATED metal loss resulting from corrosion attack enhanced by spalling of corrosion products. Fig. 14.

WALL THINNING resulting from spalling of a carburized case in a Type 304 tube in an ethylene cracking unit. Fig. 15.



CARBURIZED CASE at failure in Type 304 tube shown in Fig. 15 above. Fig. 16.

by W. L. Nelson
Technical Editor

How Much Oil in Waste Effluents?

Of particular interest to us are analytical methods for determining the amount of oil in waste effluents, in the range of 5-50 parts per million. We hope you have information, especially for soluble cutting oils from steel machining operations. J.M.H.

This department and The Oil and Gas Journal are unable to suggest specific methods of analyses. However, the most widely used method is that of the American Petroleum Institute, "Disposal of Refinery Wastes," Sec. I, Appendix 5, "Sampling and Testing Waste Water for Oil," Third Ed., 1941, (Ref. 2). In general, this consists of sampling the water in a container that has been rinsed with solvent to remove traces that remain from other samplings; shaking the sample with solvents such as carbon disulfide-ether, carbon tetrachloride-ether, or benzol; and evaporation of the solvent in an oven. However, loss of some oil occurs during evaporation according to A. F. S. Musante (Ref. 1) who has worked with the A.P.I. Subcommittee on Sampling and Testing. He suggests a distillation method of removing the solvent, which is said to be accurate within plus or minus 5 per cent for oils boiling above 300° F.

When oil stands in the open in large amounts, the appearance of the oil film is a sensitive method of test:

Approximate thickness of film (in.)	Appearance	Approximate quantity of oil for film 1 sq. mile in area (gal.)
0.0000015	Barely visible under most favorable light conditions	25
0.0000030	Visible as silvery sheen on surface of water	50
0.0000060	First trace of color may be observed	100
0.0000120	Bright bands of color are visible	200
0.0000400	Colors begin to turn dull	666
0.0000800	Colors are much darker	1,332

Simple preliminary or control tests were described on this page December 14, 1946, page 87. References are also listed here for special materials such as sulfides, cyanides, etc.

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7. Am. Pub. Health Assoc. and Am. Water Works, "Standard Methods for Examination of Water and Sludge," 9th Ed., 1946 (1790 Broadway, N.Y. 19, N.Y.).
8. Ellis, et al., "Determination of Water Quality": U.S. Fish and Wildlife Service Research Rept., 9 (1946).
9. Rybnikova, et al., "Determination of Phenols in Sewage Waters": Zavodskaya Lab., 11, No. 1, 38-46 (1945).

References to Costs Of Transportation

What are the amounts of energy required to move freight, as B.t.u. per ton-mile, for ocean transport, barges, railroads, pipelines, etc.? Also please direct me to any reference about transportation costs.—J.A.W., Jr.

Although information must be available some place regarding the fuel consumption of railroad locomotives, ships, barges, etc., no references are readily available to this department.

With respect to the cost of transportation of oil and coal, the many references shown below have appeared on the Questions on Technology page of The Oil and Gas Journal. Reference 1 is especially useful because it indicates the amount of fuel required to develop 1 b.hp. when using various types of prime movers. References 2-6 pertain to the heating value of various fuels. The remaining references apply generally to transportation and its cost.

References

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3 Effect of Sulfur on Value of Residual Fuel Oil, Sept. 13, 1954, p. 138.
4. Maximum Variations in the Heating Value of Residual Fuel Oil., Sept. 20, 1954, p. 299.
5. Thermal Efficiency when Firing Oil and Coal, Jan. 12, 1953, p. 131.
6. Cost of Handling and Firing Coal and Fuel Oil (3 parts), May 26, p. 265; June 1, p. 118; and June 8, p. 141, 1953.
7. Cost of Tanker Transportation—USMC Rates, Sept. 7, 1953, p. 113.
8. SCALE and USMC Tanker Rates, Aug. 20, 1956, p. 241.
9. Ocean Distances and Freight Rates, Dec. 14, 1953, p. 157.
10. Pipeline Transportation Costs, Sept. 21, 1953, p. 351.
11. How Much are Pipeline Gathering Charges? Aug. 16, 1954, p. 150.
12. What Price Oil Trucking? Jan. 18, 1954, p. 117.
13. How Transportation Costs Compare, March 29, 1954, p. 132.

Comparison of Smoke Points

We are confused about the meaning of smoke points determined by what is called the "Factor" lamp. Does this lamp give the same smoke point as the common I.P.T. lamp?—S. Wm. G.

The most widely used lamp for the determination of smoke point is the lamp adopted by the Institute of Petroleum (I.P.T.) during the early 1930's. It was developed primarily for determining low smoke points. Recently, the test has been used more widely for testing diesel fuels and jet fuels, and interest has again turned to the Factor lamp (Terry and Field, Ind. Eng. Chem., Anal. Ed., 8, 293, year 1936) which can be used for higher smoke points. Finally, Rakowsky and Hunt have developed what is called the Indiana lamp, which covers the entire range of smoke point. Smoke points by the Factor and Indiana lamps are much the same (see Table 1), and the values are higher than the conventional I.P.T. lamp.

TABLE 1—APPROXIMATE RELATIONSHIP BETWEEN SMOKE POINT LAMPS

I.P.T. smoke point	Factor	Indiana
10	12	9
15	18	17
20	28	27
25	38	37
30	49	49
40	73	75
27	40	40
36	60	61
42	80	83
48	100	104
51	120	126
..	140	148

unhappy because of wet jobs...?

to avoid wet jobs

specify

MODEL 63

oilmaster

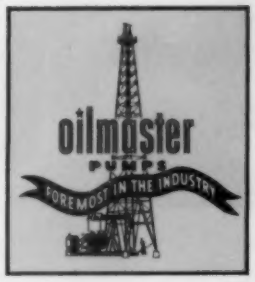
BOTTOM DISCHARGE VALVES

Wet jobs are caused by a pump that is stuck so tightly in the tubing string that it cannot be unseated with the sucker rods. The sticking is most commonly caused by sand settling around the pump barrel above the hold-down. The worst hazard occurs in a stationary barrel bottom anchor pump, where the sand can fill in all the way to the top of the pump.

It has long been known that a bottom discharge valve would keep the area between the pump and tubing free of sand by discharging a portion of the produced fluid at the hold-down. As long as the upward velocity of the fluid exceeds the settling rate of the sand, the annulus remains clean.

Prior to the introduction of the Oilmaster Model 63, bottom discharge valves have not been as dependable a unit as the other components of the pump. Still, they were in common use by operators who preferred to pull a pump prematurely if necessary, rather than risk pulling a string wet.

The Model 63 represents an entirely new approach to the pump valve design problem, and has overcome the weaknesses that previously existed. Numerous improvements have been made that can best be appreciated by a demonstration. Call your Oilmaster representative and ask him to bring out a Model 63 on his next call, or better, ask him to insure you against wet jobs by having him install them on all your stationary barrel bottom anchor or Multiple Tube Fluid Packed Pumps. Try them on long stroke pumps too, to eliminate the need of a top seal element.



FLUID PACKED PUMP CO.

Main Office and Plant, Los Nietos, California

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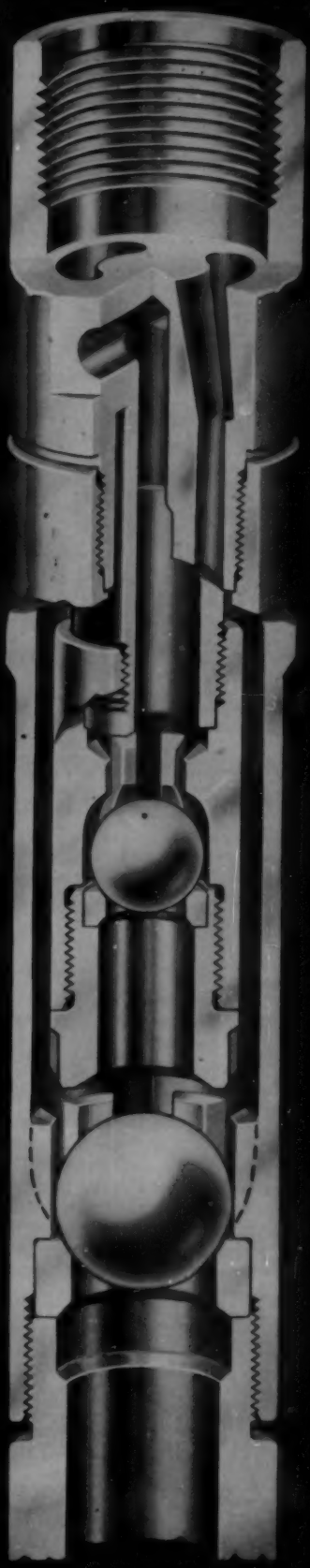

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If mud gets to your joint threads, it can wash out a string in a hurry. 'Bestolife Lead Seal Tool Joint and Casing Compound gives maximum, tight joint make-up, keeps mud out. Standard of the oil country for over twenty-five years. Unconditionally guaranteed. Packed in 1¼, 5, 20 and 50 lb. containers. Sold by leading supply houses throughout the world.

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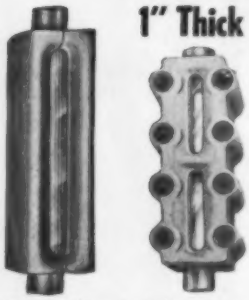

Gage glass in Inferno gages is 1" thick, specially tempered and heat treated. This glass is held in the gage by equal pressures on both sides around the entire edge of the glass. The body is machined from solid bar stock. Write for Bulletin No. 33.

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INFERNO

Among the Drilling Contractors

New Delta Barge-Rig Joins Offshore Drilling Fleet

DELTA MARINE DRILLING CO., offshore contracting affiliate of Delta Drilling Co., Tyler, Tex., has a new submersible drilling barge in operation in the Gulf of Mexico off the Louisiana coast.

It bears the name of Chris Zeppa, Delta Marine vice president.

A complete, self-contained unit and assembly, it is designed for operation in water depths up to 30 ft. It provides accommodations, air-conditioned, for a crew of 37 men.

The barce proper, with its superstructure, is 180 ft. long, 60 ft. wide, and 50 ft. high. The drilling assembly is centered around an Ideco "Big Giant" draw works. Four 450-hp. Caterpillar D-397 engines provide power. Through compound, they pull two 825-hp. Gardner-Denver GXRG mud pumps and two 600 kw., 1,100 r.p.m. generators supplying electric power to two 800-hp. (at 595 r.p.m.) motors on the draw works. It has a Lee C. Moore 142-ft. by 26-ft. cantilever-type mast complete with a 7-sheave crown block.

American Marine Corp., of New Orleans, designed and built the barge. At recent formal acceptance ceremonies, Delta Marine was represented by Joseph Zeppa, president; Chris Zeppa, J. M. Gardner, and Thornton Tarvin, vice president; I. J. Flowers, drilling superintendent; and George Stetson, chief engineer. Participating for the builder were Leslie B. Durant, presi-

NEW drilling barge accepted — Top, left to right: Chris Zeppa (namesake), and Joseph Zeppa, vice president and president, respectively, Delta Marine Drilling Co. (owner); and Leslie B. Durant, president of American Marine Corp. (builder), on deck of drilling barge (bottom), pictured at dedication ceremonies in New Orleans shipyard.

dent; H. E. Briet, vice president; and Walter Michel, assistant vice president.

Buster-Gardner Drilling Co., Franklin, La., is on another deep well Union Oil Co. and Monterey Oil Co. are starting in the newly discovered Isle Dernieres field in Lake Pelto, 4 miles southwest of Lake Pelto field, on the coast of Terrebonne Parish, Louisiana. Plans call for a 11,500-ft. test to confirm the above operators' oil discovery 2 weeks ago at their 2 State Lease 2649, completed in a 10,700-ft. sand.

Gulf Marine Drilling Corp. is to drill Forest Oil Corp.'s second well in the East Cameron Block 4 area, in the Gulf of Mexico, about 2½ miles off the coast of Cameron Parish, Louisiana. Forest's first well was completed in August 1955. It is productive of gas and condensate from a 13,100-ft. sand.

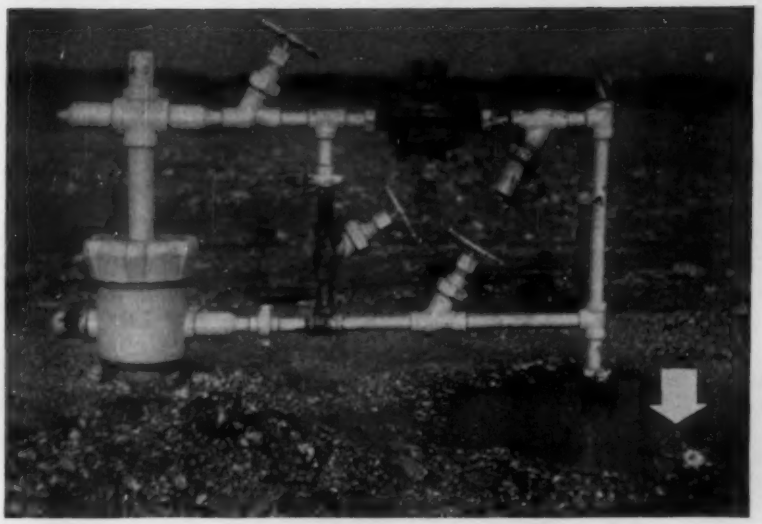
Hayden Farmer Drilling Co. has a rig running for W. C. Perryman and I. P. LaRue, of Athens, Tex., at a wildcat location 6 miles south of LaRue, in Anderson County, East Texas. It is a 5,100-ft. Woodbine test at 1 Henderson, in the Eli Steadman Survey.

John S. Hagestad Drilling Co., Bakersfield, Calif., has a new operation in the Mountain View area, southeast of Bakersfield, in Kern County, California. It is a 5,600-ft. schist test at 1 McCulloch-Di Giorgio, in 3-31-29. Location is northwest of Arvin.

Gracey-Hellums Corp., Houston, has contracted for another deep test Union Oil Co. of California proposes to drill in the Simon Pass area, on the north side of Lake Palourde, in St. Martin Parish, Louisiana Gulf Coast. Location, at 1 St. Martin Parish School Board, in 16-15s-13e, is about a mile north of production opened last year by California Co., and northwest of another deep test Union has under way. Permit calls for a 13,500-ft. test.

Jack Halbert Drilling Co., Kilgore, Tex., is under way on a new contract job in northwestern Cherokee County, East Texas. It is a 5,200-ft. Woodbine test for E. A. Ellison, of Tyler, Tex. Location, at 1 Douglas, in the John Vaughn Survey, is 3 miles southwest of Bullard.

Jordan Drilling Co. is on a 6,500-ft. job 3 miles south of Slocum, in southern Anderson County, East Texas. It is for Texkan Oil Co., of Dallas, at 1 Wallace, in the E. Austin Survey. It is a wildcat to test the sub-Clarksville and Woodbine formations.



The right steel valve can

CUT MAINTENANCE COSTS

on water flood projects

It's easy to go wrong on valve selection for water flood injection well service. In West Texas, (note field conditions in photo above—one Edward globe valve installed below ground level) and elsewhere too, weatherproof valves are needed. Blowing sand, sun and rain increase valve maintenance—frequently make valves inoperative.

For this service Edward recommends Fig. 2698 forged steel, inside screw globe valve (see illustration below) with bonnet exterior EValized (corrosion resistance plated) and precision built interior. Only the packing nut thread is exposed and this thread can't rust. Suitable for throttling, this low cost valve can be installed and forgotten. Make sure you aren't paying good money for the wrong *type* valve on water flood projects. Get free, *expert* assistance. Contact your nearest Edward oilfield representative, or your favorite oilfield supply store.

THESE FEATURES SAVE YOU MONEY!

Free flowing, no pockets to collect sediment!

EValloy stainless steel seats and disks borized in mated pairs!

EValized bonnet, with corrosion resisting threads!

Centerless ground stem for long packing life!

Easy packing adjustment!

Oversize handwheel for easy operation!

Forged steel bodies and bonnets!

Fig. 2698—2000 lb WOG Globe Stop Valve

Edward Valves, Inc.

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ROCKWELL MANUFACTURING COMPANY

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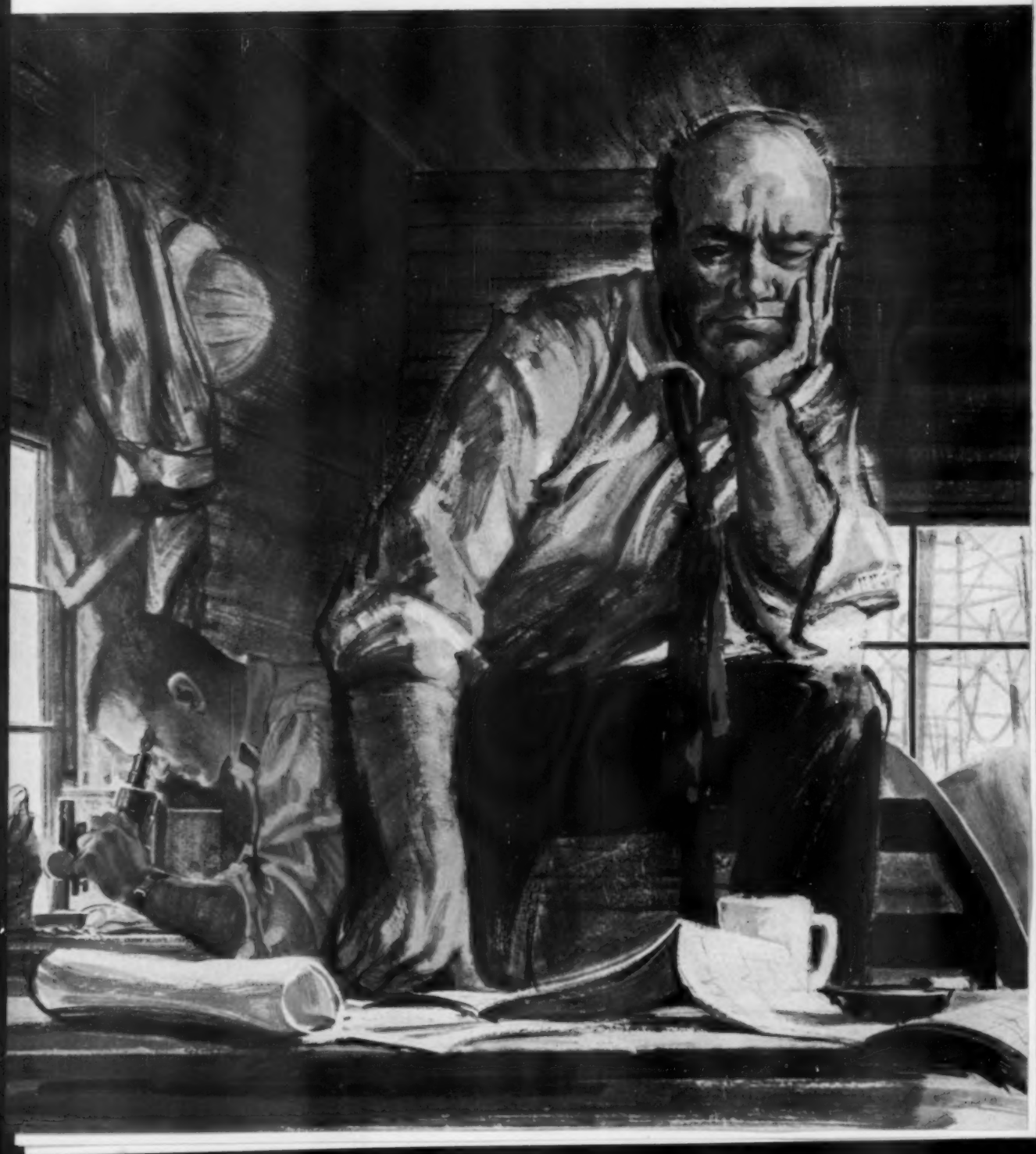
To set pipe or not to set pipe.....



. . . . has this ever been your $64,000 question ?

Few indeed are the oil men who have been spared the necessity of making this decision. The well in question may be a wildcat. Perhaps it is a stepout from a proven field. There are some indications of *possible* oil or gas production. A lot of money is riding on your decision.

In such cases you need every ounce of *accurate* formation data possible to obtain. True formation pressures are a must. Inaccurate pressure indications could influence you to abandon a commercially productive well. Or they might cause you to set a string of costly pipe and send more good money after bad.

Helping operators answer this tough question is old hat with Johnston (29 years to be exact). The Tension Type Pressure Recorder used *exclusively* with Johnston Formation Testers is so sensitive that it faithfully records pressure changes of as little as *five one-hundredths of one per cent!* A rugged built-in thermometer and clock leave absolutely no need for guess work or approximation.

Whether it is a well of questionable productivity or a well in a proven reservoir, you want the truth and nothing but the truth insofar as formation pressures are concerned. That's what you get with a Johnston Test . . . not approximate pressure values.

JOHNSTON TESTERS

first in drill **stem testing**

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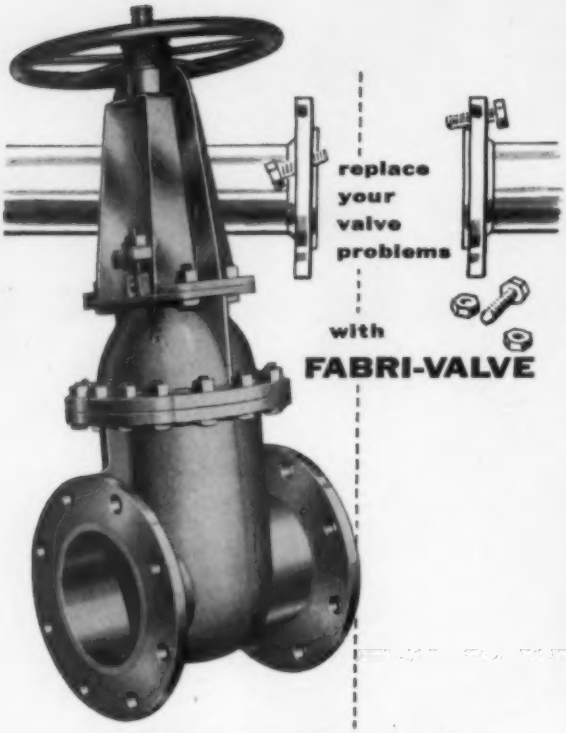
THERE'S A DIFFERENCE IN DRILL STEM TESTING . . . AND JOHNSTON MAKES THE DIFFERENCE!



Fabri-Valve fabricates valves to meet specification for old or new. Whatever your need, new installation, modernization or replacement F-V can economically supply the answer to your valve problem. Custom-made or standard, F-V's are available in all sizes from 2" up in mild steel, stainless steel, nickel, or any workable combination to meet your specific problem. Contact your nearest distributor for complete details on how Fabri-Valves help solve your valve requirements.

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GET PRESSURE RELIEF PROTECTION WITH KINZBACH

The Model 112 Kinzbach Automatic Pressure Relief Valve for Mud Pumps gives positive, instantaneous pressure relief at maximum volume and automatic restoration of circulation upon correction of the overpressure condition. All elements of the circulating system are protected from excessive pressure at all times.

Services utilizing extremely high pressures such as acidizing, cementing and fracturing find the Model 112 meets their safety requirements.

Kinzbach Model 112 Pressure Relief Valves come in 2" and 3" sizes and pressures ranging from 500 psi to 16,500 psi. Write for complete catalog or see your Composite Catalog.

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WHY NOT LET BrakeSolve YOUR PARAFFIN Problem?

BRAKESOL is the safe, economical way to clean up and control paraffin in your production system. By using BRAKESOL, you get more production, by reason of having unrestricted flow and by avoiding those tank bottoms.

BRAKESOL is being used all over the world today and is accepted as one of the most effective methods of treating and controlling the paraffin problem.

BRAKESOL is safe to use and will not harm the skin, and the danger of fire hazard has been greatly minimized.

BRAKESOL is non-corrosive and will not harm production or refinery equipment.

HOLDS PARAFFIN IN SUSPENSION from FORMATION to REFINERY

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New Iberia, Louisiana	Emerson 9-3498
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GOOD SERVICE NEAR YOU

There's a BRAKESOL Treating Engineer near you who can show you the most effective methods of application to solve your paraffin problem . . . in one easy operation. Contact him TODAY, he'll be glad to help you. For additional information, write us direct, or contact your local supply store.

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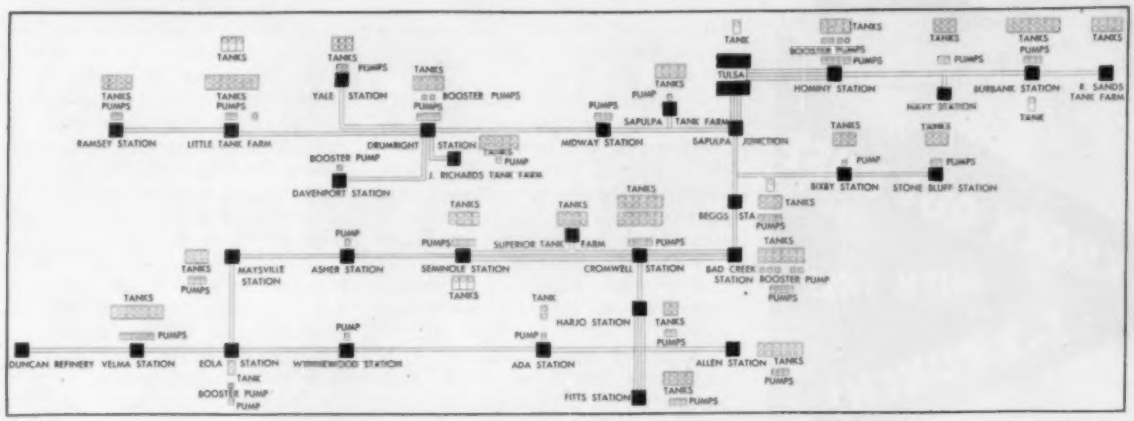

DISPATCHING CHART shows Mid-Continent's crude-gathering pipeline system.

Mid-Continent simplifies dispatching as . . .

Central board controls crude flow

A NEW control board has greatly simplified dispatching on one of the nation's largest crude-gathering systems.

Mid-Continent Pipe Line Co., from its Tulsa general office, controls the movement of some 145,000 bbl. daily through its 3,000-mile system which supplies the West Tulsa and Duncan refineries of D-X Sunray Oil Co. D-X is the parent company of Mid-Continent and a subsidiary of Sunray Mid-Continent Oil Co.

What the board shows . . . The dispatcher's board is essentially a visual-aid map of some 2,000 miles of main-line facilities: 31 pumping stations, the units at each station, and all tanks. It has made operations more efficient by removing much onerous routine and detailed work from the dispatcher. When a dispatcher starts his shift, he can see quickly what situation exists without being briefed on every detail. He can see from the board what units are running, what is happening at each tank, what lines are operating, and which of eight different types of crude is being pumped in a given section of the line.

Colored blocks tell whether the crude is mixed (generally for making motor fuel), select (high paraffin for lubes and greases), Burbank (which parallels select), or black (asphaltic crude similar to mixed). They also indicate whether these crudes are mixed with natural gasoline or whether the stream is water-white gasoline. Progress through the line also is shown. The number of barrels of line fill is indicated along each segment of the line.

Colored lights show whether a tank is receiving oil, is being pumped, or is being floated.

Remote shutdown . . . The Tulsa dispatcher can monitor all 27 units at the nine major stations on the main line and can shut them down remotely. Periodically, he dials the semiautomatic stations which are unattended and listens to each unit to see if it is functioning properly. He becomes familiar with every pump. When one doesn't sound right, it is shut down and a mechanic sent to investigate.

This procedure recently saved a radiator core at one of the station units. The mechanic found a loose bearing in the fan. The suspicious sound was made by the fan hitting the

NEW two-position dispatcher's board installed at Mid-Continent Pipe Line Co.'s general offices, Tulsa. Dave Billington, left, and Clarence Davis check the new board which shows stations, pumping units, tanks, and main arteries.

KNOCK OUT RUST WITH THIS 1-2 PUNCH!

1. **Prime** with Rustmaster, proved by laboratory comparison tests to be the best rust inhibitor!

2. **Finish** with one of General's specialized industrial coatings.

RUSTMASTER SYSTEM

Ask for details and specifications.

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Peerless Supply Co., Inc.

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Shreveport, La.

PIPELINE PATROL

radiator, and in a short time the core would have been ruined had the unit not been shut down.

The remote shutdown also proved valuable last spring when a live pipeline was cut by a contractor ditching for a parallel line. The contractor telephoned the dispatcher immediately, the station affected was shut down in a matter of seconds, and kept down until repairs were made. Oil loss was held to a few barrels, and potential damage on the right-of-way was avoided.

Only one station can be started from Tulsa now. Later, remote starting is expected to be applied to other stations to improve efficiency and cut operating costs. There is also the advantage, when a leak or break occurs, of being able to start a unit remotely while field personnel remain at the scene of the trouble to see if the repair job is adequate.

Four of the stations telephone hourly reports to the dispatcher. These reports show which tanks are pumping, the gage in inches, oil received during the previous hour, pressure of the pumps, and the gravity and b.s. and w. of the oil being pumped.

Telemetering . . . Oil pumped by five major stations is telemetered in Tulsa. The remote counters (lower right in photo) keep a constant check on the volume pumped by each station, or through each line when there are multiple lines from a station. These counters are read hourly to see if throughput is on schedule. If there is a sizable discrepancy, it is investigated immediately.

Telemetering has a double benefit. It eases the load on the dispatcher and cuts operating costs considerably at the stations. Before the telemetering circuits were installed, tanks had to be gaged at stations every hour and the information telephoned to Tulsa. Now this same information is at the dispatcher's finger tips. Several station engineer - gagers have been displaced and absorbed elsewhere in the company in better jobs.

More than two-thirds of the oil handled by Mid-Continent is telemetered. Four additional telemetering circuits have been approved; others are projected for the future because of the obvious economies. As Mid-Continent strives to improve its competitive position in the movement of crude oil, telemetering and remote control is proving to be the most fruitful means of reducing costs.

Tapline perfects corrosion control

. . . Desert introduces many problems

TRANS-ARABIAN PIPE LINE encounters all manner of soil conditions along its 754-mile length across the Arabian desert, Jordan, Syria, and Lebanon. And the problem of perfecting an adequate corrosion-control program has been a big one.

The 30 and 31-in. crude line, running from Qaisumah, Saudi Arabia, to Sidon, Lebanon, has 375 miles of pipe above ground and 379 miles buried. The buried sections range from 30-ft. camel crossings to stretches of several miles in low areas. Soil resistivity varies greatly. And corrosion control has been complicated by the line's remoteness as well as the diverse conditions.

The line, completed in 1950, was primed, coated with asphalt, a glass-fiber floss, another coat of asphalt, an outer wrapper of asbestos felt, and rock shield in some areas. But later inspections revealed inadequate bonding along a major portion of the buried line, generally due to dead primer. Coating conductivity varies from 10 to several hundred micromhos per square foot.

Early cathodic protection . . . Cathodic protection was started as soon as Tapline was laid. Protection from the 100-volt 70-amp. rectifiers at pump stations soon proved to be more limited than surveys indicated. Magnesium anodes on short buried sections in high-resistivity soils was generally inadequate. Constant increase in current requirement due to settling of backfill and coating deterioration soon dictated establishment of cathodic-protection stations at shorter intervals.

A power line used along the whole system would have been too costly, so diesel-driven generators were selected as the most-economical current source. The 246-mile Turaif-Sidon section goes through soft soil, lava, and rocky soil. Coating conductivities run high; coating is damaged extensively by rock.

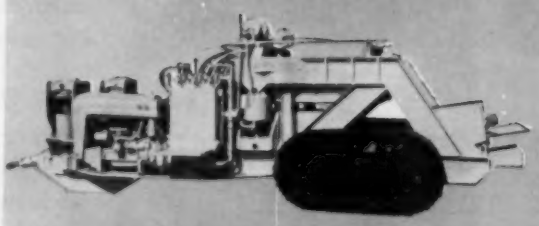
Digested from "Control of External Corrosion on the Trans-Arabian Pipe Line," by F. M. Maasry, presented before N.A.C.E. in St. Louis.

CROSE ADDS ANOTHER GREAT PRODUCT TO THE LINE...

Crose is proud to announce the addition of CINCH vertical hydraulic pipe bending machines to the Crose family of pipeline construction equipment. Crose recognizes the CINCH machines as the finest pipe bending equipment on the market. They are lighter . . . faster . . . more compact . . . now manufactured in three sizes . . . handle pipe up to 36" in diameter . . and they are an important complement to the Crose line of equipment now used in around-the-world pipeline construction.

All CINCH operations will be conducted under the name of Cinch Division of M. J. Crose Manufacturing Company, Inc., at our new divisional headquarters, 7020 Long Drive, Houston, Texas.

CINCH



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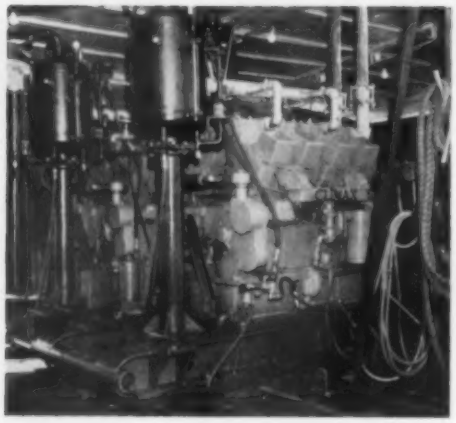
VAPOR PHASE® ELIMINATES RADIATORS, FANS, WATER PUMPS ON DRILLING ENGINES

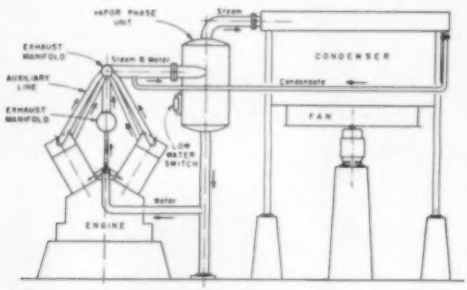


High Temperature Cooling Increases Horsepower; Reduces Fuel, Lube, & Maintenance Costs

Rig No. 1 of Choya Drilling Co., Inc. has increased engine horsepower by nearly 20% at an approximate cost of $6 per bhp., by installing a Vapor Phase cooling system.

WEST Texas' first Vapor Phase cooled rotary rig is in operation at Midland, Texas, headquarters for the Choya Drilling Co., Inc.

In addition to doing away with many of the items essential to conventional drilling engine cooling systems, the Company has increased the power of the rig's two main engines from 265 to 325 hp., while still operating at the same manifold pressures. It is no longer necessary to change radiator cores frequently, or de-scale engine jackets, since the Vapor Phase system is a **closed** system, requiring no make-up water.



Engine jackets are flooded with water at boiling temperature: steam and water go to separator; steam to *portable* condenser (skids not shown). Condensate is drained to hot well, and returned to Vapor Phase system by a pump to maintain proper liquid level.

"Sole Developers and Manufacturers of Vapor Phase Thermal Circulation (Ebullition Engine) Cooling"

ENGINEERING CONTROLS Incorporated

An Affiliate of St. Louis Shipbuilding & Steel Co.

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St. Louis 1, Mo.

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Pipeline Patrol

The most-economical station spacing was 11 miles, normally limiting potential at the drain point to 3 volts. This section is protected from rectifiers in Turaif, Qaryatain, and Sidon, and 14 intermediate unattended diesel-driven generator stations. The ground beds almost all require watering during the dry season. Water must be hauled up to 62 miles.

Unattended stations . . . Generators are connected directly to the diesel engines. Each generator is rated at 6.5 kw. capable of operating continuously at as low as 40 per cent of rated voltage. New generators will have a 12-volt dynamo for field excitation so they can operate at from 65 amp. at 100 volts to 162 amp. at 40 volts, meeting variable current requirements well.

Lube facilities were added to permit 4-day operation of the engines.

Except for four cathodic-protection stations in Syria, all the engines operate on crude oil tapped from the main line into a storage tank. Each unattended station has two generating units operated alternately on a weekly cycle, assuring over 90 per cent time operation.

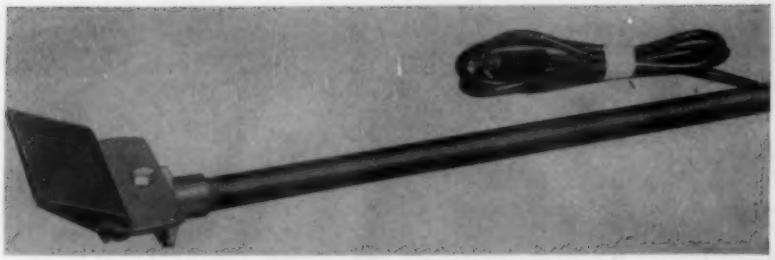
Buried sections . . . The short buried sections between Qaisumah and Turaif were inadequately protected by magnesium anodes. In February 1955, Tapline experienced its first main-line corrosion leak on a 1,600-ft. buried section.

Pump-station corrosion . . . Numerous leaks occurred on control and instrument lines in pump stations which had partial protection from 100-volt 70-amp. rectifiers at each station. Current drained hadn't provided complete protection. Principal areas of low pipe-to-soil potential are near scraper traps and the pump house containing instrument lines. Complete protection from a remote anode is usually uneconomical in such cases.

To assure complete protection of station piping: (1) all areas of low pipe-to-soil potential have been located through detailed measurements at 50-ft. intervals in a grid pattern over the entire industrial area; (2) supplementary protection will come from two 100-volt 25-amp. rectifiers connected to a number of graphite anodes distributed over the low potential areas; and (3) anodes will be installed 20 ft. from the piping. Current requirement from such a system is usually small, but high voltage is required because of high soil resistivity.

SHOWCASE...

NEW EQUIPMENT



New Silicon Electrode Holds Its Shape

Even in hot-coating material, this new electrode for holiday detectors, made of conductive silicon, will not "wet." And it holds its shape and conductivity in temperatures from —20° to +450° F., according to the maker.

The silicon, which looks and feels like black rubber, will wear indefinitely. It is molded around a metal backing plate which has mounting holes for bolting the electrode to a wand.

Pipe-coating materials such as hot bitumens will not adhere to the silicon due to its inherent nonwetting property. Functioning equally well on dry or moist surfaces, it has a natural resistance to abrasion which gives the electrode a long life.

The rubberlike flexibility of the silicone material will conform to surface irregularities during the testing process and will readily indicate holidays in paint or dielectric coatings on tees, valves, tanks, and structures. **Write or call: Tinker & Rasor, 417 Agostino Road, San Gabriel, Calif., for details on silicon electrode.**

●

Oil Filter Is Easy to Service

Designated the R Series, this new oil filter features a throwaway cartridge and easy service of its simplified three-piece construction.

The filter is especially designed for filtering lubricating oils used in internal combustion engines, for oil-bath air filters, and for filtering various industrial oils, fuel oils, solvents, and coolants used in chemical-process industries. **Write or call: Hilliary Corp., Elmira, N. Y., for Bulletins F-135, 153, and 154.**

A. C. Motor for Drilling, Provides Three Power Ranges

A feature of this new a.c. squirrel-cage polyphase 220/440-volt 60-cycle electric motor for oil-well drilling service is that it provides three ranges of horsepower in a single motor. This is accomplished by changing the wires in the conduit box on the motor.

A typical example is the Frame 444 motor. It provides a choice of 30, 20, or 12 hp., depending upon the horsepower required for a particular phase of drilling. This means that when only 12 hp. is required for a particular operation, it is not necessary to use 30 hp. resulting in savings in power costs.

Built for outdoor duty the motor is available in synchronous speeds of 1,800, 1,200, and 900 r.p.m. **Write or call: Brook Motor Corp., 3553 West Peterson Ave., Chicago 45, Ill., for details on three-horsepower-in-one motor.**

●

Sump-Pump Motor Has Lightweight Design

Though built to operate partially submerged, this new sump-pump motor can be operated completely under water, if necessary. It has a starting switch which is controlled by a weight-and-float arrangement.

Fitted with cast-iron end shields, the motor's corrosion-resistant enclosure is built to meet severe operating conditions. Rugged overbolt construction gives the sump-pump unit maximum

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of **April 22, 1957**

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

sealing protection and over-all rigidity.

The motor is carried easily by a special handle on its top. Portability and water resistance of the Design 2/50 motor makes it suitable for use during excavation work, according to the company.

Every motor is pressure tested individually at the factory. Ball bearings are lubricated permanently with an improved grease for long, dependable service with minimum maintenance.

Write or call: General Purpose Motor Dept., General Electric Co., Schenectady 5, N. Y., for details on Design 2/50 sump-pump motor.

●

Bell-and-Spigot Sealer Speeds Leak Repair

Here's a newly perfected method for repairing leaking bell and spigot joints. Called E-Z Poxy, the method consists of first venting the leakage to allow a tough epoxy resin compound to harden and firmly bond to the leaking surface. Then the final seal is made by plugging the vent hole after the resin has hardened.

This method has been successfully tested for over 3 years and provides a permanent, time-saving, inexpensive method of repair which is easy to apply, the maker claims.

The method and material are available for all joint sizes in a handy packaged kit with instructions. **Write or call: A & H Engineering Co., 1425 Campbell Street, Glendale 7, Calif., for details on E-Z Poxy.**

●

J-M Asbestos and Tar Felt

C-R-C Glass Wrap

C-R-C Outer Wrap

CRC

ALL YOURS...

FROM ONE SUPPLIER

Now you can fill all your pipeline needs from pipe wraps to pipe "pigs" from ONE supplier, Crutcher-Rolfs-Cummings, Inc.

C-R-C has chosen only the finest equipment and supplies for distribution to the pipeline industry. You have a choice, too:

15, 20, or 25 mil Glass Wrap
8 or 15 lb. J-M Felt
12 lb. Outer Wrap
2" to 36" O. D. Casing Insulators
2" to 36" O. D. Casing Seals
4" to 36" O. D. Scraper "Pigs"
any length of Rock Shield

Take advantage of faster service by grouping your complete supplies order with C-R-C.

Manufacturers - Sales - Service

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C-R-C Kelley Rippers
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Vertical Pipe Benders
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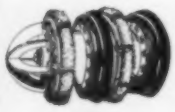
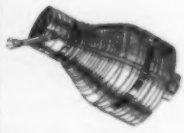
Parsons Trenchliners
Esco Buckets and Teeth
C-R-C IMCO Bevelers
C-R-C Dope Kettles
T&R Holiday Detectors

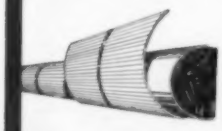
Casing Insulators



Scraper "Pigs"



Casing Seals



Sealtight Rock Shield

CRC

CRUTCHER • ROLFS • CUMMINGS, INC.

HOUSTON, TEXAS
P. O. Box 2073 UNderwood 4-6391

FARMINGTON, NEW MEXICO
P. O. Box 1207 DAvis 5-5523

Electro-Mechanical System Indicates, Measures, Records

The signal transmitter shown here is a component of the new ElectroSyn system developed for use in the natural gas, petroleum, and chemical processing industries. The system is a nonelectronic signal-generator system for the measurement, indication, transmission, and control of a variety of process variables.

These variables include pressure, differential pressure, flow, liquid level, and temperature. High reliability, low maintenance, and flexibility are cited as significant features of the system.

In measuring pressure, differential

It takes a complete team to keep dependable drilling mud service available for you

Meet this Magcobar Man, the barite plant worker who helps process millions of tons of Magcobar every year

He's supervising the separation, by Magcobar's original flotation process, of only the highest quality barite from native ore out of the Magnet Cove deposit. The Malvern, Arkansas plant, built in 1939, and still the model of processing plants, has the largest capacity of any single barite plant in the world. Continuous expansion, with modern innovations, keeps this plant operating at greater capacity every year. Other Magcobar barite plants are located at New Orleans, La.; Lake Charles, La.; Brownsville, Texas, and Battle Mountain, Nevada.

The ability to find and process more barite every year to meet the demands of the oil industry has distinguished the Magcobar organization since its inception.

In every Magcobar plant, good men are provided with modern plant facilities to insure you of an adequate supply of the finest quality drilling fluids in the oil fields.

MAGNET COVE BARIUM CORPORATION

Houston, Texas

Magcobar
Complete
DRILLING MUD SERVICE

stop this

in salt water disposal well tubing

use Fibercast WELL TUBING

This is Fibercast, *an unretouched photograph of Fibercast Well Tubing after 2½ years in disposal use. No deterioration! No loss of strength!*

More than 5 years proven successful operation in down-hole tubing, and still going where other materials fail in a matter of a few months. All this adds up to real protection of the Casing & Well investment.

Fibercast is non-corrosive — plus:

1. Tensile & Joint Strength — For settings to 7,000′ depths.
2. Collapse Strengths — Allows filling the annulus with protective fluids.
3. Acidizing — Is safe directly through the Fibercast Tubing.
4. May be Engineered with or without Packer.
5. Fast Thread System and Light Weight makes for low installation cost.

WELL TUBING FIBERCAST LINE PIPE

THE FIBERCAST CORPORATION
A Subsidiary of The Youngstown Sheet and Tube Company
Sand Springs (Tulsa), Oklahoma

Distributed by
CONTINENTAL-EMSCO COMPANY
A Division of The Youngstown Sheet and Tube Company
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Serving the Oil and Gas Industries .. Worldwide

New Equipment

pressure, or flow, the signal transmitter, by means of a twisted Bourdon tube for pressure, or bellows for differential pressure and flow, converts the process variable into a shaft rotation of a rotary differential transformer. Output from the transmitter is an a.c. voltage exactly proportional to the variable (12 volts full scale).

When measuring temperature, the signal transmitter is simply a temperature-sensitive resistor and the (feedback) ElectroSyn is replaced by a precision potentiometer. **Write or call: Norwood Controls, Unit of Detroit Controls Corp., 934 Washington Street, Norwood, Mass., for details on ElectroSyn system.**

●

Catalyst-Loading Elevator Speeds Materials Handling

Called the Dinosaur, this catalyst-loading elevator is a mobile unit with a telescoping boom which can be extended, when in a vertical position, to a height of 70 ft. The boom can be stowed in a horizonal position and the entire unit moved easily and conveniently from station to station.

With the unit, catalyst material can be fed by means of a barrel-dumping device to a vibrating screen which may perform a scalping operation. The screen feeds to a zipper conveyor belt which elevates the catalyst to a head pulley at the top of the boom. It is then discharged into the reactor. Discharge heights on the boom are adjustable from 45 to 70 ft. in 5-ft. increments.

When on the zipper belt, material moves forward and upward in a column without agitation or churning action, eliminating degradation almost completely, the maker states.

The elevator will deliver catalyst at a rate of 15 to 30 tons per hour, depending on the cubic-foot density. The boom may be moved into close proximity to structure walls and overhangs.

With the Dinosaur, no materials need be handled manually above grade level. The conveyor will readily serve the requirements of new cracking installations which have not been provided with material-handling facilities or will replace outmoded systems.

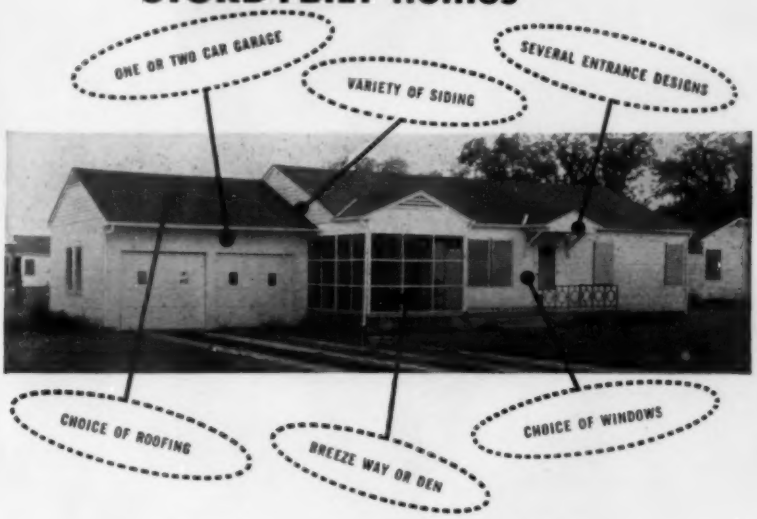
The mobility of the unit is an advantage where the cracking-plant operator has a number of points to service. It also eliminates the major problem posed by stationary charging equipment which is normally idle much of the time. **Write or call: Stephens-Adamson Mfg. Co., 40 Ridgeway Avenue, Aurora, Ill., for details on Dinosaur conveyor.**

●

Pneumatic Transmitters Allow Stepless Range Change

This line of pressure and differential-pressure transmitters utilizes a null-balance vector principle. The transmitter's

VARIETY makes individual and attractive STURDYBILT homes



Industrial housing developments need not be made of "look alike" houses. Even when floor plans are the same, exterior appearances can be changed so each STURDYBILT Prefabricated home may have an attractive, individual personality of its own.

Specify STURDYBILT Prefabricated Homes for every field housing need.

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

DO AS THE ROMANS DID

From Roman armor to the flak suit, complete protection has been accepted as the only worthwhile kind. Since 1939 Tube-Kote has perfected techniques to insure *complete* protection against corrosion. This experience is your assurance of complete protection.

TUBE-KOTE

SERVICE MARK REG. U. S. PAT. OFF.

CUSTOM

PLASTIC COATING FOR SPECIALTY ITEMS

Custom Coating – the newest service of Tube-Kote, manufacturers of world-famed TK-2 – offers plastic lining protection for specialty items subject to corrosion or contamination. Backed by 17 years of experience in applying plastic

linings to metal surfaces, this new Tube-Kote service features the use of TK-2 plastic, TK-31 epoxy coating, and TK-88 Teflon.

A specially engineered process is designed for custom coating each item to provide it with the best protection.

TK-2 Plastic – This plastic is most practical for use on items needing protection against corrosion damage and certain abrasive actions. Proved in field use on more than 16,000,000 feet of oil field pipe, TK-2 combines inertness with toughness, hardness, and adhesion to make it the outstanding finish for custom coating. TK-2 is available in TK-2 Standard for prevention of corrosion; and TK-2 Special for prevention of paraffin deposition; and TK-2 Custom Kote for extra duty protection in tanks, valves, fans, fittings, pumps, Christmas trees, mandrels, etc.

TK-31 Modified Epoxy. Newest baked-on product in the expanded line of engineer-approved Tube-Kote plastics. TK-31 combines flexibility, toughness, special abrasive resistance characteristics, and exceptional bonding ability . . . making it the answer to many unusual problems in coating or lining applications.

TK-88 Teflon – This plastic is a high-temperature, anti-sticking material. It provides excellent protection against both sticking and scaling.

Tube-Kote
INCORPORATED
2727 HOLMES ROAD
P. O. BOX 20037
HOUSTON, TEXAS

New Equipment

design principle permits compactness, low weight, and stepless changing of each instrument's range with a screwdriver, the maker states.

The range change is accomplished by changing the angle at which input forces are applied to the linkage, thereby altering the component of such forces that must be balanced. Standard models of both instruments operate on 20-psi. air pressure and produce output signals from 3 to 15 psi., normally using about 0.2 s.c.f. per minuate of air.

Virtually all parts of the two instruments are interchangeable, excepting the primary measuring elements. The latter include a diaphragm assembly for pressure - differential measurement and Bourdon tubes, bellows, or diaphragm for pressure measurement.

Where both types of units are employed in one plant or system, their great similarity in operation and interchangeability of parts simplify both the training of personnel and the stocking of spare parts, according to the company.

Since the instruments balance forces, primary fluid flows are nearly zero; hence, contamination of the measuring elements is said to be eliminated. **Write or call: Republic Flow Meters Co., 2240 Diversey Parkway, Chicago 47, Ill., for details on pressure and differential-pressure transmitters.**

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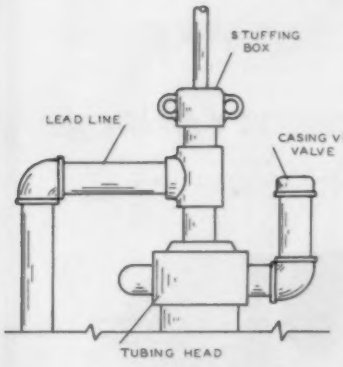

Automatic Vent Valve Keeps Gas Out of Casing

Designed for water-flood and disposal wells, this automatic vent valve is a direct-acting float valve with a plastic float and synthetic rubber valve. Its body is electro-plated steel. Models are available with plastic lining for high corrosion resistance.

When installed on a pumping water-flood well (as shown) the valve will vent gas from and prevent well flow through the casing.

The Model C is single acting. It permits air to enter the casing. The Model D is double acting. It keeps air out of the casing and permits gas to escape. It can be used in gas-gathering lines to keep wells from flowing into the gas line and on gravity-input wells and high points on gravity lines to prevent air lock. The Model D valve is plastic lined to resist corrosion. **Write or call: Kenneth N. Mills, 4128 East Thirty-third Street, Tulsa, Okla., for details on vent valves.**

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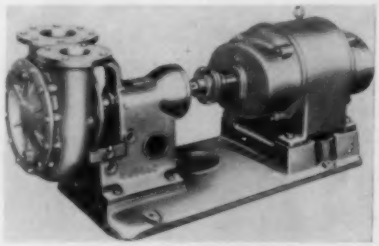


Aluminum Bronze Pump Developed for Salt Water

Designed to decrease the corrosive effects of oil-field salt-water pumping, this Fig. 3715 centrifugal chemical pump is now available in aluminum bronze. While only 80 per cent as heavy as regular bronze, the aluminum bronze is exceptionally tough, according to the manufacturer. It has an impact strength of 20 to 30 Izod and a Brinell hardness, as cast, of 190.

Other features of the aluminum-bronze pump include suction and discharge connections in the casing. Removal of the casing cover permits the interior of the pump to be inspected or cleaned—without disturbing any piping connections. Similarly, the impeller may be removed or replaced without disturbing the piping.

The stuffing box is on the suction side of the impeller. Pressure on the stuffing box is therefore limited to the suction head or pressure under which the pump operates. This feature insures long packing life and freedom from excessive leakage, the maker states.

Should wear eventually occur between the impeller vanes and the casing, provision is made for external adjustment of clearance between the two parts.

There are nine available pump sizes, ranging from ¾ by 1 to 3 by 4, providing a broad range of capacities and heads. **Write or call: Goulds Pumps, Inc., 27 Black Brook Road, Seneca Falls, N. Y., for details on Fig. 3715 aluminum-bronze pump.**

SHOWCASE . . .

New Equipment

Industrial Heaters and Devices are covered in 72-page Bulletin GEC-1005H. A 16-page power-requirements section shows short and long-form calculations for heating applications. The publication includes information on such new products as redesigned cartridge heaters, miniature soldering irons, aluminized steel-sheath strip heaters, and new ratings and configurations of finned tubular heaters, along with descriptions of new ceramic-to-metal and plastic resin hermetic seals. The publication includes data, specifications, operating information, and manufacturer's recommended list prices of standard heaters and heating devices. **Write or call: General Electric Co., Schenectady 5, N. Y., for Bulletin GEC-1005H.**

●

Crawler Tractor, the 200-hp. TD-24, is pictured and described in eight-page, two-color mailer entitled "Boss of the Big Jobs." The pamphlet emphasizes the solid framework of the unit, power steering, and the option of torque converter or gear drive. Line drawings illustrate components of the torque-converter drive system and the main frame. And a cutaway exposure explains the power-steering system. Diagrams illustrate steering-clutch positions when an operator desires that the unit make gradual, feathered, or pivot turns. **Write or call: International Harvester Co., Construction Equipment Div., 180 North Michigan Avenue, Chicago 1, Ill., for Folder CR-565-G.**

COOL ANSWER TO A HOT PROBLEM
R & M "All-Weather-40" MOTORS
Because excessive heat shortens motor life and seriously reduces the effectiveness of lubrication, R&M "All-Weather-40" motors are designed to run cooler . . . even in the blazing sun! High velocity clean-sweep ventilation between the frame and windings prevents the sun's rays from adding appreciable internal heat. Under severest conditions, heat rise never exceeds 40° C.
Get complete information now on cooler-running R&M "All-Weather-40" motors. Write for Bulletin 3019-DGJ or call your R&M representative.
ROBBINS & MYERS, INC.
Motor Division
Springfield, Ohio

●

Portable Rotary Drilling Rig for shot-hole and water-well drilling to 350 ft. using 2⅜-in. lightweight drill pipe is pictured and described in new Bulletin RM-712. The bulletin features field photographs and complete specifications illustrating the flexibility of the rig. A schematic diagram illustrates the placement of the unit assemblies. **Write or call: Joy Mfg. Co., Oil Field Drill Div., 6540 Hines Boulevard, Dallas, Tex., for Bulletin RM-712.**

●

High-Pressure Hose Couplings are described in new eight-page Bulletin 115. This publication covers applications of couplings for use on high-pressure air, steam, gas, hydraulic, and liquid hose used in construction and petroleum refining. **Write or call: Le-Hi Div., Hose Accessories Co., 2704 North Seventeenth Street, Philadelphia 32, Pa., for Bulletin 115.**

●

A Salvage Program for Oil Refineries is the title of this new special service report covering cleaning materials and equipment for the petroleum industry. Service Report B4885 describes recently developed detergents which remove rust, grease, and old paint in one simple soaking operation, requiring no brushing, scraping, or sandblasting. The new materials are nonacidic and safe on both equipment and personnel, and they have long solution life, according to the report. **Write or call: Oakite Products, Inc., 159 Rector Street, New York 6, N. Y., for Service Report B4885.**

●

First-Aid Supplies. Valuable first aid and field protection advice as well as detailed information on unit-system first-aid kits and components is included in Catalog 100. Printed in three colors and profusely illustrated, the 32-page plastic bound catalog provides diverse information, ranging from proper snake-bite treatment to a chart showing correct unit-system kits and supplies for various industries. **Write or call: Medical Supply Co., Rockford, Ill., for Catalog 100.**

●

Specialized Tools and Services for the oil industry are described and explained in this new 40-page 1957 general catalog. This catalog gives a comprehensive

explanation of the sizes, applications, and operation of McCullough tools and services. Covered in the catalog are such tools as bullet perforators, a chemical tubing cutter, glass-jet perforators, a drillable bridge plug, and a magnetic collar locator. A completely revised section gives the latest information on McCullough radiation well-logging service with a highly sensitive scintillation counter. **Write or call: McCullough Tool Co., 5820 South Alameda Street, Los Angeles 58, Calif., for 1957 general catalog.**

●

High-Speed Analog Computers are discussed and explained in this eight-page booklet. In question-and-answer style the booklet defines certain types of computers and summarizes the applications of each type. It then discusses the virtues and limitations of high-speed analog computers, as compared with real-time computers. In simple terms, the booklet answers questions such as the following: (1) What are the virtues of analog computers over digital computers? (2) What are the relative accuracies, physical sizes, and power requirements of high-speed and real-time computers? (3) What are typical fields of application for high-speed computers? **Write or call: GPS Instrument Co., Inc., 811 Boylston Street, Boston 16, Mass., for booklet on high-speed analog computers.**

●

Diaphragm Actuated Hydraulic Pilot Valve which operates with water or any other suitable hydraulic fluid is pictured and described in this two-color leaflet. Designed to provide extremely accurate control of diaphragm valves that are used either as reducing or unloading valves, the pilot valve responds to pressure variations of as little as 1 psi. in the flow line to adjust the main regulator for throttling of steam, gas, or liquid flow. The catalog sheet contains photographs, cutaway diagrams, valve features, recommended applications, and specifications. **Write or call: Atlas Valve Co., 280 South Street, Newark 5, N. J., for pilot-valve leaflet.**

●

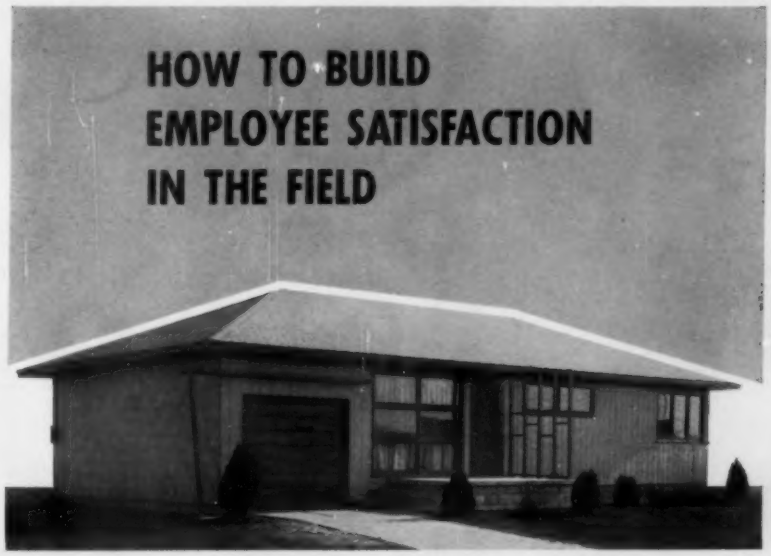
Horsepower Rating Data on Allis-Chalmers oil-field engines are featured in new four-page Bulletin BU 165. The data covers 16 natural-gas-powered models, 15 models powered by either butane or propane gas; 17 diesel engines, and 14 engines powered with gasoline. In addition to listing the number of cylinders, piston displacement, bore and stroke, and maximum torque at various r.p.m. of each engine; the bulletin also includes information on the horsepower of each model at various operating speeds. An outline in the bulletin suggests a method of determining usable horsepower ratings for various oil-field services. **Write or call: Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wis., for Bulletin BU 165.**

●

Heat Exchangers for Generator Cooling and Chemical Processing are described and illustrated in new 12-page Bulletin 1200. It describes the design and construction of finned-tube units for both air and hydrogen circulated through the generator windings in a closed system. The bulletin illustrates and explains the application of each type of unit as applied to generators. Drawings and photographs illustrate the details of each design. **Write or call: Griscom-Russell Co., Massillon, Ohio, for Bulletin 1200.**

●

High-Temperature Equipment for use in processing plants is the subject of Technical Reprint TR-544. The report discusses the use of steel and its various alloys and the mechanical and physical reactions of the materials under various temperature and corrosive environments. **Write or call: Tubular Products Div., Babcock Wilcox Co., Beaver Falls, Pa., for Technical Reprint TR-544.**



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The employee whose family lives in a modern designed, well planned comfortable home is your most satisfied—and valuable—employee. Let Whitmor provide all your field employees with site fabricated, quality housing. Whitmor homes are constructed from highest quality materials at most reasonable cost. A wide range of designs and floor plans are available—or we build to your specifications. Many companies use Whitmor's "lease-rental" plan—ask us about it.

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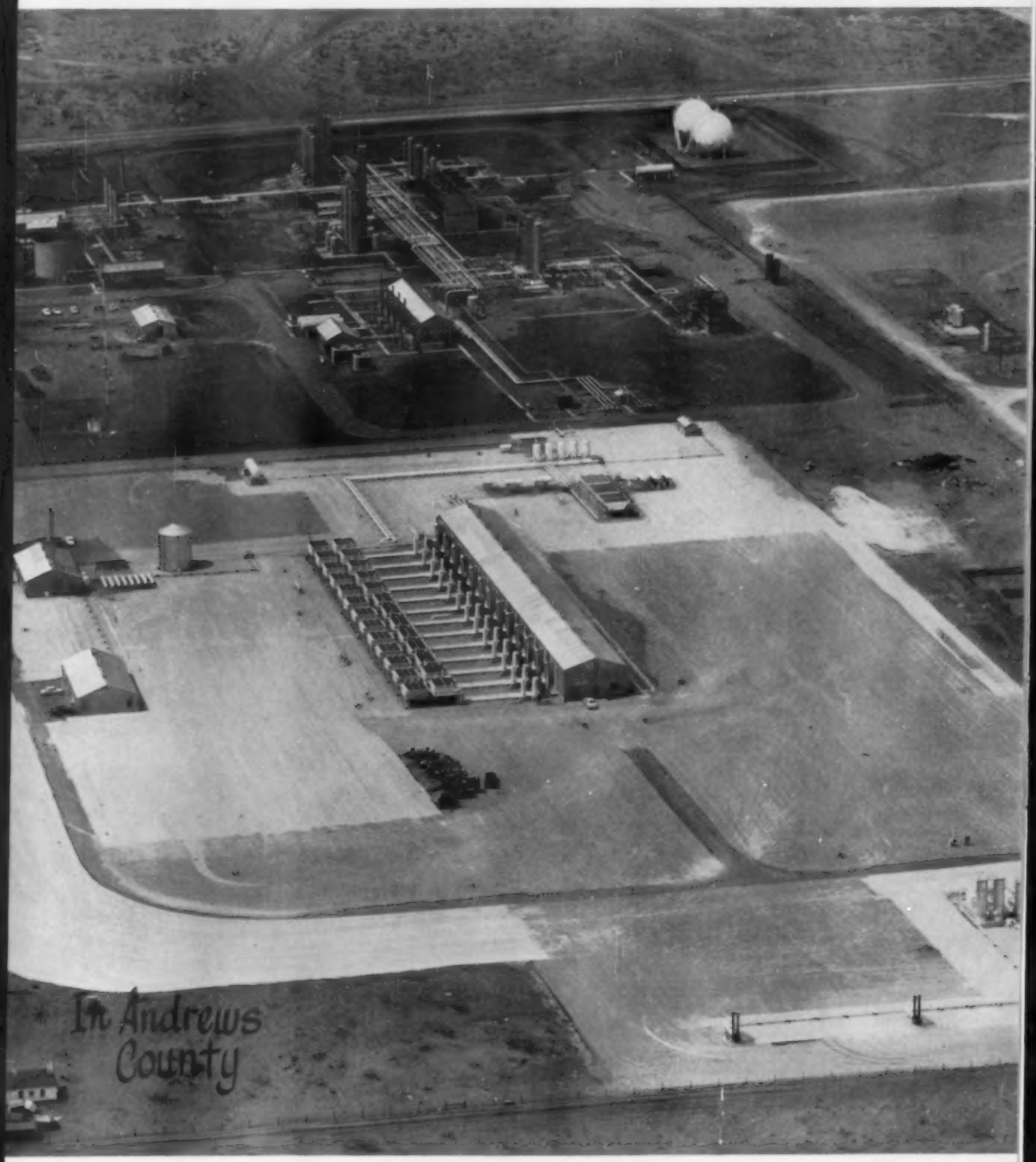

GASOLINE PLANT CONSTRUCTION CORP.

ENGINEERS . . . DESIGNERS . . . CONSTRUCTORS

ESPERSON BUILDING, HOUSTON

EQUIPMENT MEN . . . in the News

Walter Kidde Names Haines Petrochemical Engineer

HARRY HAINES

Harry Haines, former associate editor in charge of the Houston office of Chemical & Engineering News, has been named petrochemical contract engineer for Walter Kidde Engineers, Southwest, Inc., Gerald T. Shannon, vice president, has announced.

During his association with Chemical & Engineering News, Haines was the author of many articles on chemical and petrochemical industries in the Southwest. He was one of the major contributors to the publication, "Chemicals in the Texas Gulf Coast."

Production Technology Class Tours Houston Plants

A highlight of every School of Production Technology, held twice yearly in Kilgore, Tex., is a field trip to the Houston area where school participants view service company centers and manufacturing plants. Here, the group was visiting W-K-M Manufacturing Co. plant. The group also toured the plants of Schlumberger Well Surveying Corp. and Cameron Iron Works. Arrangements for the trip were made by Glen Wilber of Weatherford Oil Tool Co. The 7-week school is sponsored by American Petroleum Institute and the petroleum extension service of the University of Texas.

Hixon Joins H_2Oil's New Rocky Mountain Office

H_2Oil Engineering Corp. of Tulsa is expanding its operations by opening an office in Casper, Wyo., to serve the Rocky Mountain territory. James L. Hixon has been appointed sales and service representative, with headquarters in Casper. Hixon's appointment was announced by Russell D. May, president.

American Marc Acquires Hallett's Diesel Engineering

American Marc, Inc., recently acquired complete ownership and management, as well as all real and improved property, of diesel engineering division of Hallett Manufacturing Co., Inglewood, Calif. The move, announced by W. Denis Kendall, president of American Marc, is important to county and southern California industry because it places American Marc in the position of the county's largest manufacturer of air-cooled diesels.

W. D. KENDALL

Management of American Marc is composed of both new appointees and former Hallett executives. President Kendall has a long history of executive accomplishment both in this country and abroad, starting with Budd Manufacturing Co. and including Citroen Motor Car Co. of Paris, where he was once a director of manufacturing. In 1955 he became president and director of American Marc.

Russell G. Livingston, veteran of 15 years in the engineering and government liaison departments of the Hallett firm, is vice president in charge of sales of American Marc. Wren Jones, with Hallett for 6 years, is Livingston's assistant and parts and service manager. The new chief engineer, Tom B. Danckwortt, German diesel expert joined the American Marc organization last year.

The basic products of American Marc are four high-speed, lightweight, low-horsepower diesel engines.

The new plant of American Marc, Inc., at Inglewood, Calif.

S. M. Jones Names Suggs Shreveport Representative

The appointment of W. R. (Bill) Suggs as district sales representative for the northern Louisiana, Arkansas, and Mississippi territory has been announced by L. J. Pundt, general sales manager of The S. M. Jones Co.

W. R. SUGGS

Suggs has had many years of oilfield-equipment experience. His headquarters will be at Shreveport.

Brown Oil Tool Names Ad Manager, Sales Engineers

The appointment of Pat Loper as advertising manager for Brown Oil Tool Co. and new assignments in the sales division have been announced by Ray L. Brown, vice president in charge of sales.

Frank Smith has replaced Loper as sales engineer for the Gulf Coast. A new sales engineer operating out of the Houston headquarters is Bernie Fitzgerald. R. C. Buchanan, sales engineer in the Houston region, has been temporarily assigned to Canada and will represent Brown with Import Tool Co.

Loper has been a sales engineer with Brown for 4 years. Previous to that he was with Otis Pressure Controls, Inc. for 10 years. Until recently, Smith was with Oil Center Tool Co. in West Texas.

Vinegaroon's electro-mechanical control equipment . . . acts on leg gears (above) to raise

Mobile Drilling Platform for Tideland Operations

Just commissioned at New Orleans, the Vinegaroon, patterned after its forerunner, the Scorpion, is already at work for its owners, Zapata Off-Shore Co., on a Sun Oil Co. lease 15 miles off Cameron, La.

The 2,500-ton tripod drilling rig was fabricated by R. G. LeTourneau, Inc., at its Vicksburg, Miss., plant and was fitted with derrick and associated equipment at New Orleans where formal commissioning ceremonies were held.

The drilling rig, including draw works, catworks, and pumps was manufactured by United States Steel Corp.'s Oil Well Supply Division. American Iron & Machine Works Co. supplied Straight Grip tool joints, drill collars, and other accessories. Caterpillar Tractor Co. and General Motors Diesel Engine Division provided prime power units. The mast is a 140-ft. Lee C. Moore with a 30-ft. front leg spread.

Spuds or legs are operated by 27 LeTourneau electric gear motors, 9 in each spud housing. Its 145-ft. legs provide for raising the drilling platform to the height of a 10-story building above the ocean floor.

Group of officials at the commissioning program were: E. J. Deu Pree, assistant general manager, production, California Co.; Claude L. Griffin, sales manager, American Iron & Machine Works Co., Inc.; Hoyt Taylor, chief engineer, Zapata Off-Shore Co.; Max Clayton, general manager, drilling, Shell Offshore Oil Co.; George Bush, president, Zapata Off-Shore Co., and Wayne Dean, vice president and general manager, Zapata Off-Shore Co.

Vinegaroon's drilling equipment is located below the rig's main platform deck. Delivering prime power for drilling operations are four Caterpillar D397 turbocharged diesel engines equipped with Twin-Disc torque converters. Three Oilwell mud pumps and an Oilwell Model 96 draw works are driven through mechanical compounds by these engines.

Weatherford Sets Up New Offices, Names Managers

R. F. KERCHER

The establishment of four new district offices in Great Bend, Kans., Lake Charles, La., Hobbs, N. M., and Farmington, N.M., has been announced by Weatherford Oil Tool Co.

The manager of the Great Bend district office is Robert F. Kercher. Tom McClelland manages the office in Lake Charles. The western division of Weatherford recently opened a new

T. McCLELLAND

C. C. COPELAND

district office in Hobbs with J. T. Liner as manager. Charles C. Copeland is manager of the new office in Farmington.

Kercher has been with Weatherford since 1955 and had previous oil-field experience in Illinois, Colorado, Texas and Oklahoma. McClelland joined Weatherford in 1956 and worked as a sales and service engineer out of Lafayette, La., until his recent promotion. Liner has been with the company as a sales and service engineer and district manager in the North Texas area for 2 years. Copeland formerly was district manager in Glendive, Mont.

Oilwell Makes Gulf Coast And Canadian Appointments

The appointment of Carol R. Burton as manager of United States Steel Corp.'s Oil Well Supply Division store at Alice, Tex., and naming of Sidney G. Pierce, Dean L. Cook, and Charles S. Long as field representatives have been announced by M. F. Jones, Gulf Coast area manager of the division. Pierce will be located at McAllen, Tex., Cook at Pettus, Tex., and Long at New Iberia, La.

The appointment of Christopher H. Marshall and Matthew Sydor as field representatives at Estevan, Sask., and Valley View, Alta., Canada, and naming of Howard Rainbird as city representative at Edmonton, Alta., have been announced by W. A. Weir, Canadian area manager.

TI Appoints MacIver As Public Relations Manager

DON MacIVER

Appointment of Don MacIver as public relations manager of Texas Instruments, Inc., has been announced by Marketing Vice President S. T. Harris.

A veteran former newspaperman, MacIver comes to TI from the Missouri-Kansas-Texas Railroad where he was assistant director of public relations for 3½ years. He previously served 16 years on The Dallas Morning News staff, 10 years as business and financial editor.

At Texas Instruments MacIver will direct an expanded program of public relations with immediate emphasis upon the company's community and press relations. With MacIver's appointment, TI establishes for the first time a separate department for public relations. Prior to this time, these activities have been handled by Merchandising Manager Clark W. Fishel, in addition to his other duties. Fishel will continue to head the firm's merchandising program.

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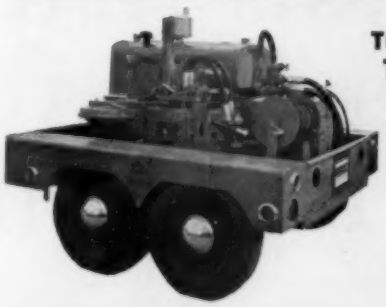

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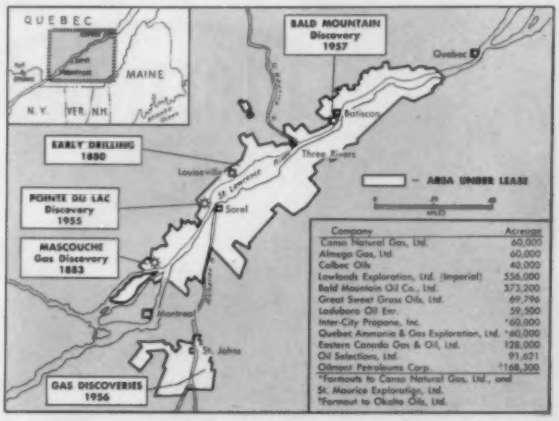
Canadian Spotlight Swings Eastward

St. Lawrence Lowlands Capture Wildcatters' Fancy

by Frank J. Gardner



THE INTENSE INTEREST in the Lowlands of Quebec is reflected in the solid block of exploration concessions stretching from Montreal on the southwest to Quebec on the northeast.

YOU can look for a summer drilling campaign up and down the St. Lawrence River in Quebec. It's not often that eastern Canada can steal the spotlight from the western provinces, but events of the past month have made exploration news of wide interest.

The strike that made the headlines was that of Bald Mountain Oil Co., Ltd. (upper center of map). This well, designated simply as No. 1, rated an official flow on test of 3½ million cubic feet of gas daily from Trenton-Ordovician at 3,000 ft. Unofficial tests, however, recorded a flow of 7 million. Operators are now under way with a second test 1,320 ft. east of No. 1.

Old gas wells . . . Now, gas wells in this Lowlands country are nothing new, but wells with potentials comparable to those of western Canada definitely **are.** For half a century, Lowlands farmers have been drilling shallow gas wells to heat their homes and their hen houses; these holes were shallow, of course, with the gas coming from beneath the glacial drift that covers much of this country. Official records reveal that some of the earliest drilling took place in 1880 near Louiseville. In 1883, at Mascouche (see map), a well designated as "the Cabane Ronde" produced at a rate of 100,000 cu. ft. per day, but no use was made of the gas.

During the past couple of years, advanced technical know-how and a large number of exploration dollars have been showered on the Quebec Lowlands for the first time. Conservative estimates place drilling expenditures so far at $2 million. A dozen active oil and gas companies have taken nearly 2 million acres of Crown concessions along the St. Lawrence between Montreal and Quebec. At Pointe du Lac, in the fall of 1955, an "accidental" gas strike was made in a farmer's water well; for 76 days, the well flowed without interruption at rates as high as 5 million cubic feet per day. It was finally plugged, by order of the Department of Mines, but a definitely commercial field was indicated.

During 1956, at least three small but commercial gas wells were completed in the St. Johns area just north of the Vermont border by Eastern Canada Gas & Oil, Ltd. These strikes stimulated interest in a wide sweep of territory into the Lake Champlain country of Vermont, and drilling now has been launched in that state *(The Oil and Gas Journal, April 15, 1957, page 91).*

And a new look . . . Typical of the "new look" in Quebec exploration is the program of Lowlands Exploration, Ltd., a wholly owned subsidiary of Imperial Oil, Ltd. This company, with 556,000 acres in four blocks along the south shore of the St. Lawrence, undertook surface geological and core-drill work there about 1953; in 1954, gravity-meter crews went in to check the surface work; in 1955, airborne magnetometer and seismic crews supplemented the previous work; and in spring 1956, the company drilled its first wildcat, the Imperial Lowlands No. 1, to 3,300 ft. This first well was dry, but the company gleaned a lot of useful subsurface dope from it, and the No. 2 well has been staked across the river from Three Rivers.

The principal tools of search in the Lowlands so far have been the core drill and the gravity meter. In all, more than 200 shallow strat tests and core holes have been sunk within the past 3 years, and a serious program of deep wildcatting can now be anticipated for both north and south shores of the St. Lawrence.

Successful wildcatting will pay off handsomely in this region. It's gas-hungry country, with enormous industrial potentialities hinging on availability of cheap fuel. The great Trans-Canada gas pipeline now snaking eastward from Alberta, plus these new developments in the Lowlands, will supply that fuel. Quebec operators haven't the problems of transportation and market here that exist for Alberta operators; in fact, wellhead prices in Quebec, it is said, should be 10 times the price paid in Alberta. The great refineries of Canada, and the largest undeveloped gas market in North America, both center in Montreal.

May mean profit . . . The hunting ground here, between Montreal and Quebec, covers 10,000 sq. miles. Geological factors all favor commercial accumulation of oil and gas pools. So with the wildcat program now predicted for this year and next, we **may** witness the birth of a new producing province which will be small but most profitable. The interest has spread, not only to Vermont, but as far east as New Brunswick and Nova Scotia, and eastern Canada may yet yield some interesting new finds.

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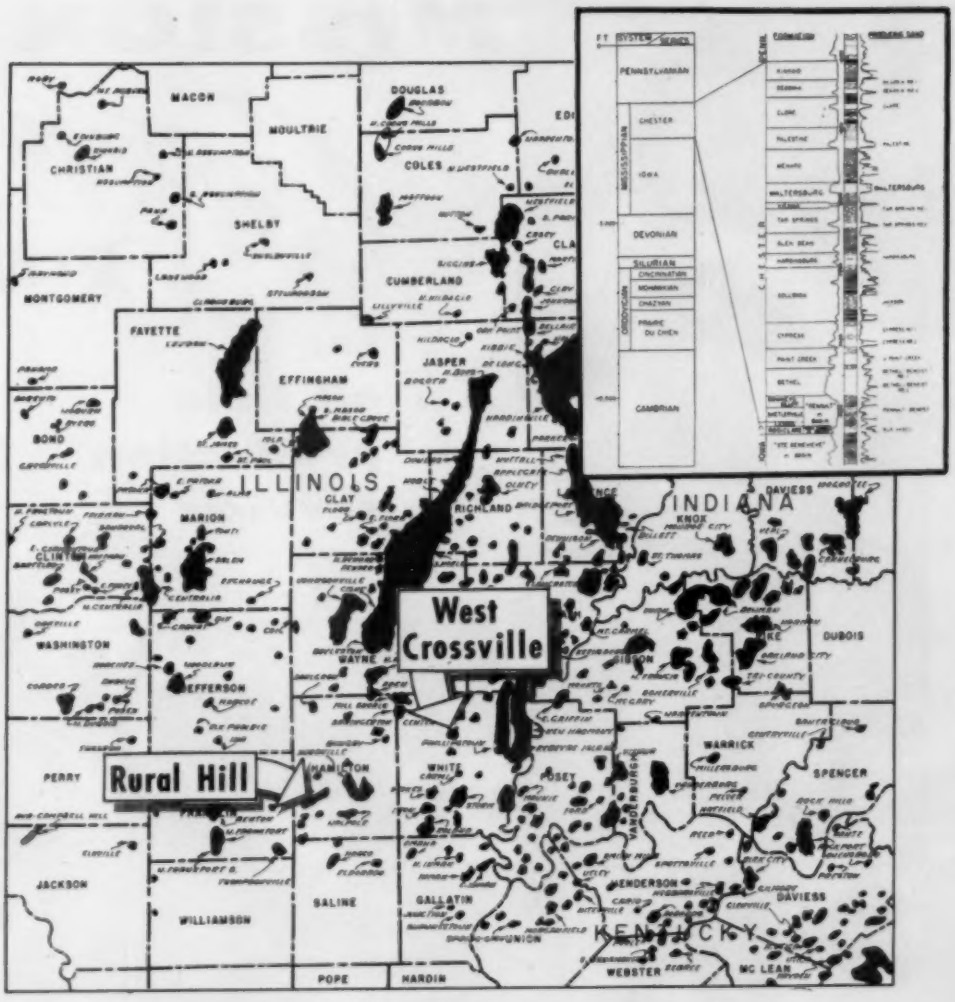


EXPLORATION in Illinois is aimed at finding and developing strat traps in the Chester. The type log shows the principal producing zones and appeared originally in Illinois State Geological Survey Report of Investigations No. 160, "Waltersburg Sandstone Oil Pools of Lower Wabash Area, Illinois and Indiana." Fig. 1.

Fracturing and other factors help as . . .

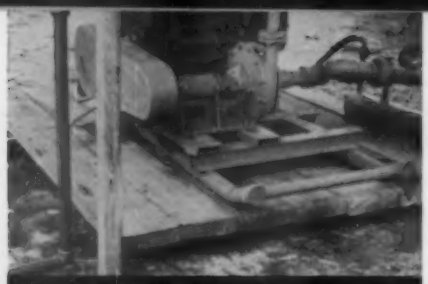
Strat Traps Lure Independents to Illinois

by Norman S. Morrisey
Drilling-Development Editor

TODAY the strat trap is uppermost in the minds of the oil finders. And this type of exploration is a prime favorite with the numerous independents that play the three-state area of Illinois, Indiana, and Kentucky. The shallow drilling depths, low cost of leasing and drilling, numerous pay zones, rapid payout on wells, and relatively low drilling hazards—all these factors have converted the Illinois basin into an independents' refuge. Another very significant factor during recent years has been the success of fracturing. Reworking abandoned dry holes has met with singular success because fracturing has converted marginal wells into paying propositions.

The fact that much of the drilling in Illinois has been carried out during the past 20 years, too, enhances the oil finders' chances for success. This means that electric logs are available on most wells. Correlations are reliable. At the same time, the electric log gives some indication of a zone's productivity. As a matter of fact, reevaluating these old electric logs has proved quite profitable for many independents in the Illinois basin.

Producing zones . . . Most of the production occurs in Chester sand lenses (Fig. 1), although oil is also found in Pennsylvanian sandstones and the McClosky (Chester) lime. During the early



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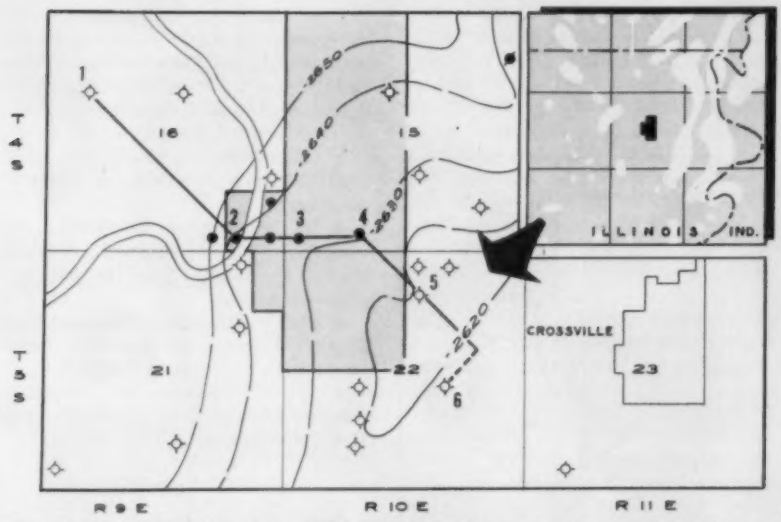


RECENTLY Calvert Drilling, Inc., and Barnsdall Industries completed an Aux Vases discovery in the West Crossville pool. Contour datum is the top of the Aux Vases sand. Fig. 2.

phases of Illinois basin exploration, geologists stressed structure. However, with the increase in well control, it is evident that much of the Chester sand production is related primarily to stratigraphy or a combination of both stratigraphy and structure.

Depth to these Chester pay zones is fairly shallow, seldom exceeding 3,500 ft. Usually several possible pay zones will be present in a well. This is especially true on the flanks of structures where structure and stratigraphy serve to trap the oil.

Significant strike . . . Calvert Drilling, Inc., Olney, Ill., and Barnsdall Industries, Tulsa, a wholly owned subsidiary of Falcon Seaboard Drilling Co., recently completed a key Aux Vases discovery in White County, Illinois, West Crossville pool. The prospect, strictly a subsurface play, started out as a typical Illinois prospect. A Tulsa consultant, Mel Fuller, pin pointed a small structure with about 20 ft. of closure and promoted a test on it. The initial oil well, drilled by Calvert and Barnsdall turned out to be a marginal McClosky producer, making 10 bbl. per day on pump. (Well No. 4, Figs. 2 and 3).

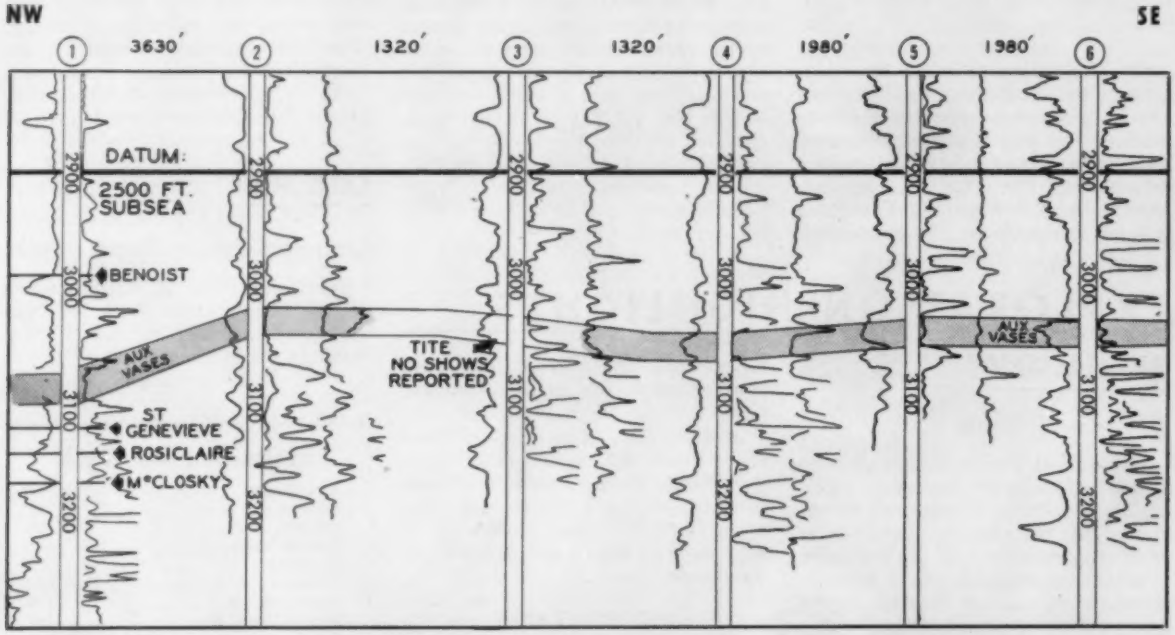
Expiring acreage, coupled with a substantial dry-hole contribution, led to the drilling of the Aux Vases discovery, the Calvert Drilling et. al 1 Stokes (SW SE SE 16-4s-10e. Well No. 2, Figs. 2 and 3). This well was completed natural for an initial potential of 1,800 bbl. per day flowing in February 1957. The 2 Stokes, completed 3 weeks later, made 225 bbl. per day natural. Since the discovery, five wells have been completed on the prospect and several tests are either being drilled or planned.

Production is already established or indicated in four different zones on the prospect, the Benoist and the Aux Vases sandstones, the Rosiclaire lime, and the McClosky lime.

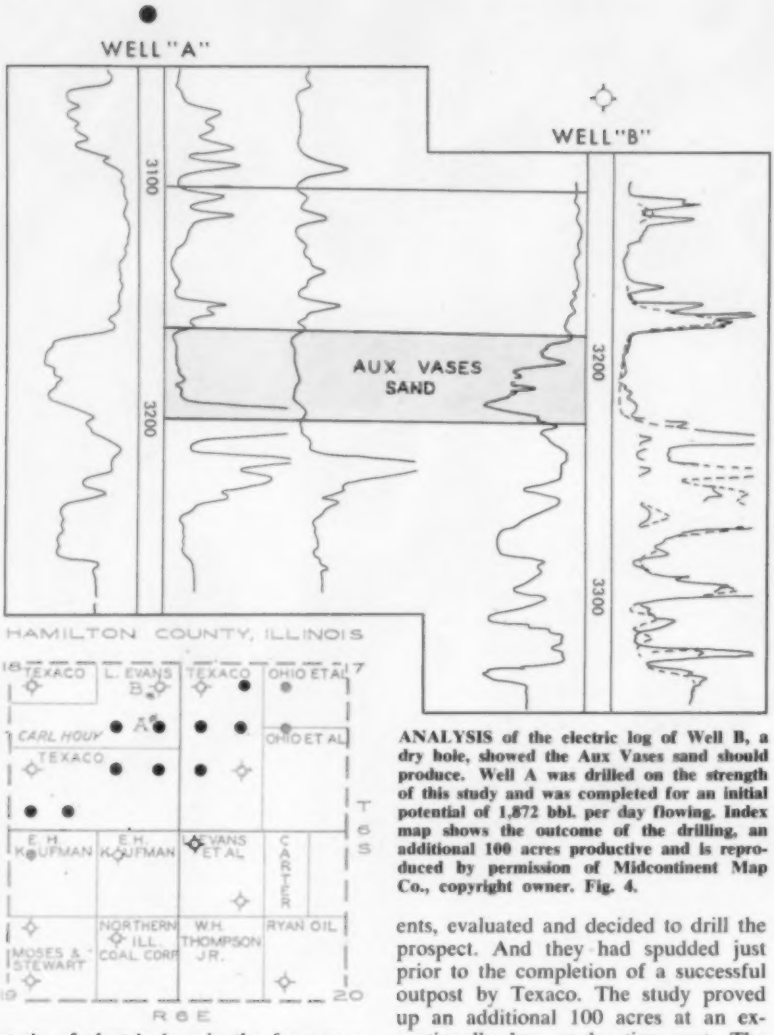
A structural map (Fig. 2), contoured on top of the Aux Vases sand, shows a low-relief anticlinal nosing with barely 20 ft. of closure. Although there is this evidence of structure, stratigraphy plays a major role in trapping the Aux Vases oil (see cross-section, Fig. 3). Thickness of the Aux Vases sand ranges from 15 to 30 ft.; the discovery logged 25 ft. of gross pay.

Reevaluating old dry holes . . . Much of Illinois exploration is concentrated on the fringes of known producing areas. Usually well control is adequate to spot a prospect. Frequently, better interpretation techniques and improved completion methods can convert abandoned dry holes into producers.

Fig. 4 shows what detailed geology can do. The 640 acres shown are on the edge of Rural Hill oil field that produces from the Aux Vases. Detailed



NORTHWEST-SOUTHEAST CROSS-SECTION shows thow the Aux Vases sand varies in thickness going updip. Notice this sand is tight and nonproductive in Well No. 3. Production has been established or indicated in the Benoist, McClosky, and Rosiclaire. Fig. 3.



ANALYSIS of the electric log of Well B, a dry hole, showed the Aux Vases sand should produce. Well A was drilled on the strength of this study and was completed for an initial potential of 1,872 bbl. per day flowing. Index map shows the outcome of the drilling, an additional 100 acres productive and is reproduced by permission of Midcontinent Map Co., copyright owner. Fig. 4.

study of electric logs in the four quarter-sections revealed that the Aux Vases should produce in parts of the area studied. This play is somewhat unusual because both independents and a major oil company, The Texas Co., were playing the idea simultaneously. Carl Houy and Lee Evans Oil Co., Tulsa independents, evaluated and decided to drill the prospect. And they had spudded just prior to the completion of a successful outpost by Texaco. The study proved up an additional 100 acres at an exceptionally low exploration cost. The potential from these new wells exceeds 10,000 bbl. per day. Ultimate recoveries in this Aux Vases reservoir are estimated at 4,000 bbl. per acre by primary methods; successful water flooding should add an additional 4,550 bbl. per acre.

EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

An outpost completion in the old Logan field in Falls Township, Hocking County, by W. H. Bears on Harvey Fink found the Clinton at 2,908-31 ft. Well developed 25 bbl. after fracture.

● Oil Development Co.-O. R. Irvin, eastward stepout of Gratiot pool in Hopewell Township, Muskingum County, made 3,000,000 cu. ft. gas and 10 bbl. oil after fracture. Clinton was logged at 3,251-92 cu. ft. and made 500,000 cu. ft. gas and show oil natural.

● East Ohio Gas Co. extended Canal Fulton field in Chippewa Township, Wayne County, north by completion of J. Magyar 2. Clinton was found at 3,872-86 ft. with 100,000 cu. ft. natural. Well was shutin at 1,655,000 cu. ft. after fracture.

PENNSYLVANIA

In Armstrong Township, Indiana County, southwest Pennsylvania, James Drilling Co. 6 W. A. Uncapher, wildcat, gaged 1,013,000 cu. ft. gas after fracture in the Oriskany sand. The Tully was at 6,870 ft., Onondaga 7,515 ft., chert 7,530 ft., Oriskany sand 7,685 ft. Total depth 7,720 ft.

● Columbian Carbon Co. 1840 Fred Musser is shut down at 6,100 ft. for rotary.

● In Washington Township, this company's 1844 Silas C. Streams reached the chert at 7,467 ft., and shut down to cement.

● Unity Township, Westmoreland County, Felmont Oil Corp. 1 James H. Rodgers is drilling at 1,055 ft.

● In Mount Pleasant Township, Peoples Natural Gas Co. 4123 Earl Shultz ran casing at 1,077 ft.

WEST VIRGINIA

Gore district, Hampshire County, West Virginia, Columbian Carbon Co. 1228 Lonze Kidwell, encountered a hole full of water at 5,284 ft.

● Portland district, Preston County, Hope Natural Gas Co. 10015 S. J. Cramer, elevation 2,356 ft., reached the Oriskany sand at 6,084 ft., and is drilling at 6,091 ft.

EASTERN KENTUCKY

In Leslie County and located on Lick Fork of Sugar Camp Branch of Bull Creek, United Fuel Gas Co. is testing oil and gas at their wildcat 27 Fordson Coal Co. After drilling to a total depth of 3,146 ft., operators plugged back to 2,417 ft. and tested an oil show from 2,395 to 2,406 ft. After shot, well tested at the rate of 20 bbl. of oil daily plus 15,000 cu. ft. of gas. Markers penetrated include: Mississippi Big Lime 2,140 ft., Devonian brown shale 2,695 ft., Corniferous 3,005 ft., and Clinton (Silurian) shale 3,142 ft.

CALIFORNIA

Standard Nears Depth Mark

Standard Oil Co. of California was nearing a new depth mark for West Montalvo field in Ventura County. Standard was drilling below 17,393 ft. on 4 McGrath after setting 7-in. casing

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to 16,209 ft. This well is located in 35-2n-23w, and is about 2 miles south of Standard's field recorder holder, the 17,696 ft. dry hole 1 Maxwell abandoned in 1953 in 22-2n-23w. Both of these tests are some 6 miles west of Superior Oil Co.'s Limoneira which held the world's depth mark in 1949 at 18,734 ft.

Neaves Gets Big Well at LaHonda

Neaves Petroleum Co. completed 5 Neaves-Union-Lane in LaHonda field, San Mateo County, as the best producer yet in its recent new shallow pay zone discovery area. The well, located in NE SE 17-7s-4w, was completed flowing 321 bbl. daily of 32.7°-gravity crude through an 18-64-in. choke. Production is from a Butano sand zone at 1,740 ft. The original discovery well flowed only 75 bbl. daily when completed last October. This activity is about 8 miles northwest of Union Oil Co.'s small Oil Creek field in the Santa Cruz Mountains.

Drillpro Redrills Tejon Test for Big Completion

Drilling & Production Co. redrilled a previously discouraging test on the north edge of the western section of Tejon field for a major producer. Drillpro had drilled the well, 53-32 JV, originally to 7,589 ft. to test for JV sand production. This effort failed. The well was then plugged back to 5,966 ft. and redrilled to 7,610 ft., where it was completed flowing 684 bbl. daily of 38.8°-gravity crude from an interval at 7,375-7,590 ft. Production was flowing through a 16/64-in. choke and included 700 M.c.f. daily of gas. The well is in SW NE 32-11n-19w in southern Kern County.

Superior Strikes Out With McClung Test

Superior Oil Co.'s efforts to extend production in its recent McClung field new pool discovery in a southwesterly direction failed. Superior took 35-33 Clark to 8,350 ft. before calling it quits. The operator has now staked a location for a southeastern extension test in 33-29s-26e, about ½ mile from the discovery.

CANADA

Road Bans Cut Into Drilling Operations

Road bans in western Canada—brought about by the warmer weather conditions now prevailing in that area—have cut the drilling phase of the industry almost in half during the past few weeks. A survey recently conducted in Calgary showed that out of the 335 rigs available to operators in the four western provinces and the Northwest Territories there are only 149 currently active on development and exploratory wellsites. Another 116 are standing on locations yet to be completed while the remainder are stacked, waiting on contracts and/or road conditions.

Compared to 1 month ago when the last survey was conducted and at which time there were 285 rigs active on drillsites or moving to them, we find that Saskatchewan and Manitoba have been hardest hit by the weatherman. Saskatchewan at that time had 53 rigs active on development tests and another 22 drilling exploratory holes; while the recent activity is limited to 19 field wells and 7 wildcat drillsites. Manitoba has three rigs at the present time, one on exploratory work and two digging development holes. The activity 1 month ago, on the other hand showed seven on development ventures and two on wildcat tests.

Alberta's present activity is limited to 93 wells made up of 48 field wells and 45 exploratory tests, while last month the survey revealed 88 rigs on development wells and 80 drilling exploratory tests. British Columbia, meanwhile, is just 5 less than last month as the current work entails 19 wildcats and 7 development drillsites.

The Northwest Territories is being worked with one rig at the present time, while last month there were two active on exploratory work.

BRITISH COLUMBIA

Best Gas Well Test Finaled at Fort St. John

Pacific Petroleums, Ltd., and associates have completed a well in Fort St. John gas field area of northeastern British Columbia with a calculated open flow potential of 137,000,000 cu. ft. daily. This is the best well thus far completed in the field, according to the reports received from the operator. The well, Pacific 65 Fort St. John was drilled on LSD 6, 16-83-18w6 during the latter part of last year. It is producing from the Triassic "D" zone and is in the main development sector of the field 3½ miles southeast of Fort. St. John townsite.

The very large absolute open flow potential rate on this well was established during recent flow tests on the well and the company is presently engaged in flow testing all previous completions in the field in preparation for gas delivery to Westcoast Transmission pipeline early this fall.

SASKATCHEWAN

Ingoldsby Stepout Is Success

Imperial Oil, Ltd., has indicated crude oil success at a stepout well in the Ingoldsby area of southeastern Saskatchewan, during recent drill-stem test operations carried out on it. This new success, Imperial 16-21 Ingoldsby, on LSD 16, 21-4-31w1, was drilled as a ¾-mile stepout to the firm's 3-21 Ingoldsby discovery hole and is the most northeasterly completion in the field area to date.

A series of five drill-stem tests were conducted in the Mission Canyon sector of the Mississippian around the 3,550-ft. mark and pipe recoveries of oil and oil-cut mud were made on the initial four, covering a 91-ft. section. The zone was penetrated on the fifth test, however, as a recovery of salt water was made.

ALBERTA

D2 Discovery Placed On Production

Imperial Oil, Ltd.'s D2 oil discovery well, 7-7 Red Deer, which was drilled as a deep pool test in the Joffre, Viking sand oil-field area of central Alberta, 3¼ miles north of Red Deer city, has been placed on steady production from that zone. Meanwhile, another well in the same area and operated by Bailey-Selburn Oil & Gas, Ltd., has also been proved productive of oil from that zone and is now on steady production as well.

The Imperial 7-7 Red Deer test lies on LSD 7, 7-39-26w4 and established a daily production rate of 245 bbl. through restricted choke; while the Baysel-Crowsnest-Conick 16-12 Burbank test, on LSD 16, 12-39-27w4, 1 mile northwest of the Imperial strike has been placed on allowable daily rate of 70 bbl. after indicating an initial potential of 250 bbl. per day.

ILLINOIS BASIN

Illinois Oil Drilling Down in March

Illinois oil well completions dropped to the lowest level in 3 years in March and no new oil field was discovered, according to the Geological Survey Division of the Department of Registration and Education. Daily average production remained approximately the same in March as in February, about 230,000 bbl. per day. Estimated pro-

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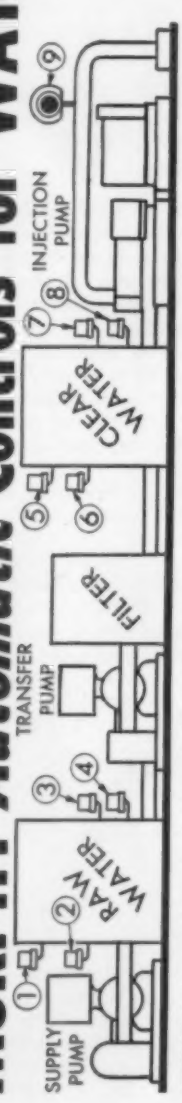

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4. Stops transfer pump before raw water tank is completely pumped out.
5. Stops transfer pump when clear water tank reaches predetermined high level.
6. Starts transfer pump when level falls to predetermined low.
7. Stops transfer pump if filter section fails to produce adequate supply. (Also will operate backwash equipment).
8. Stops injection pump before tank pumps completely out.

MURPHY Automatic Control (#9—OPL Series)

9. Stops injection pump when pressure reaches predetermined high or low pressure.

duction for March is 7,136,000 bbl. of oil.

The March drilling report shows 188 wells completed in March, a 5-week period, as compared with 167 in February, a 4-week period. Some of the decrease is seasonal, due to unfavorable road and weather conditions, which make March usually the slowest drilling month. However, there seems to be a real, as well as a seasonal, decrease in drilling.

Most of 1954, 1955, and 1956 were characterized by a high rate of drilling which began to drop toward the end of 1956. Well completions for the first three months of 1957 are about 23 per cent below the number for the first quarter of 1956. At the present time there is no concentrated area of development comparable to the drilling in the Cooks Mills-Bourbon area a year ago. Drilling is widely distributed, 17 wells being the most completed in any one county. The 188 wells completed in March include 65 oil wells and 1 gas well.

LOUISIANA

SOUTH LOUISIANA

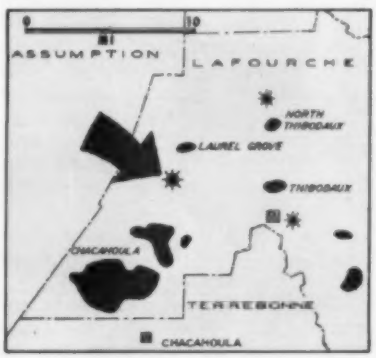
Chacahoula Discovery Taps Deep Reservoir

A deep gas-condensate reservoir is being opened 5 miles northwest of Thibodaux, in northwestern Laforche Parish.

Discovery is by Howell, Holloway & Howell at their 1 Levert, in 40-14s-15e. Production is from a perforated interval at 15,205-18 ft.

Tested through ¾-in. choke, the well flowed at the rate of 202 bbl. of condensate and 2,800,000 cu. ft. of gas per day. Pressure was 2,500 psi.

Location is about 3 miles north of production off the northeast flank of the Chacahoula salt dome. It is about



LOCATION of deep gas-condensate discovery by Howell, Holloway & Howell in northwestern Lafourche Parish.

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Due to explainable reasons, I do not desire to ask my company directors for this outlay. You are assured that participating terms affecting exploratory group, the government and myself will be ethical and reasonably correct. Must leave with my lawyer as soon as possible. Interested party may accompany us. There are no secrets. If interested please write

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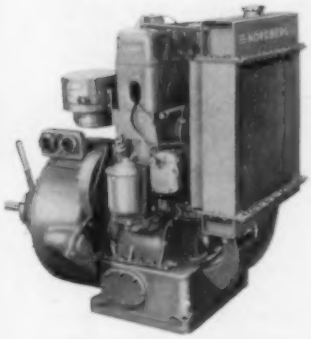

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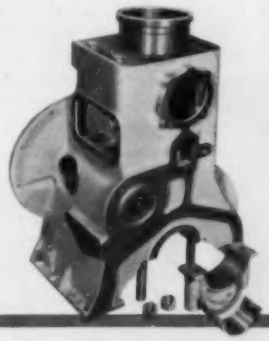

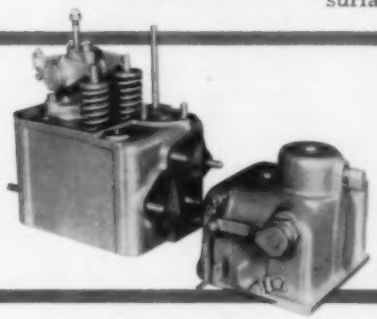

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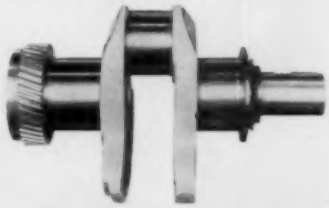

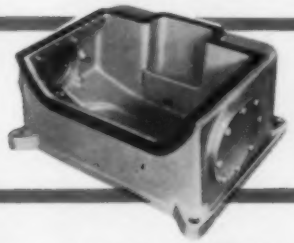

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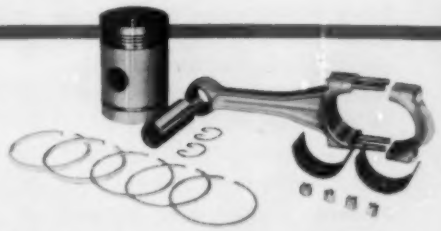

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1½ miles south of the inactive Laurel Grove field.

Oil Production Opened In North Duralde Area

Placid Oil Co. has an oil producer in its second well in the North Duralde area, southwestern Evangeline Parish. Its first well, completed in January 1956, was a gas producer making a trace of condensate.

The oil discovery is in its 2 Hillyer-Deutsch-Edwards, completed from perforated interval of 7,247-51 ft. in Frio sand after plugging back from total depth of 10,020 ft. Flow through 7/64-in. choke was at the rate of 108 bbl. per day. Gravity of the oil is 28.4°. Flowing pressure gaged 700 psi.

Location is northwest of the gas-discovery well. It was productive from Frio pay at 7,891-94 ft. Placid is drilling on its third well. It is west of the oil discovery, on the same lease. Its 1 Eunice, 2 miles southwest, is being plugged after drilling to 10,022 ft.

The North Duralde area is 1½ to 2 miles north of the original Duralde area, now inactive.

About 2 miles southeast Michel Halbouty got encouraging oil showings in an 8,160-ft. test abandoned early this year. Showings were of such promise that casing was run and a series of perforated intervals tested.

Second Humphreys Well Proves Higher Pay Zone

Shell Oil Co.'s second well in its Humphreys field, 10 miles west of Houma, in Terrebonne Parish, has been completed as a new-pay discovery.

Its pay, perforated at 10,-621-62 ft., is about 1,900 ft. higher than that of the discovery well. It tested 3,500,000 cu. ft. of gas with 186 bbl. of 53.6°-gravity condensate per day while on 7/32-in. choke.

The well, 1 Antill, in 36-17s-16e, is a northwest offset to Shell's field-discovery well (1-A Riggs), completed last August with gas-condensate production from perforations at 12,526-40 ft.

Drilled to 19,000 ft., the well became the third deepest test in Louisiana, and the sixth deepest in the world.

The Humphreys area is about midway between the large Gibson field, 3½ miles northwest, and Orange Grove field, on the southeast. Shell also is the major operator in those fields.

MICHIGAN

Scipio Trenton Field Confirmed

The Scipio Township Trenton oil and gas field, Hillsdale County, was confirmed this week—as much as a successful offset follow-up completion can confirm a pool—as both oil and gas flows were logged at Aurora Gasoline Co. and McClure Oil Co. 1 Rowe, SE NW NE 10-5s-3w, diagonal northwest 20-acre offset to Clifford A. Perry 1 Houseknecht, the yet uncompleted discovery.

First shows of gas at this offset were logged at 3,643 ft. after Trenton top was picked at 3,565 ft. Well missed top Trenton gas pay logged at the discovery.

Hole filled 3,000 ft. with oil in 15 hours from first big oil pay drilled between 3,799-3,803 ft. As drilling progress between 3,803-11 ft., well flowed oil at the rate of 4 bbl. per hour, producing approximately 60 bbl. of oil in 30 hours, or until drilling was temporarily suspended at 3,823 ft., present depth, waiting for additional storage tanks to be set.

First show of gas was logged at 3,643 ft. Additional gas pays were encountered until top gas of accumulated gas pay showed for 240,000 cu. ft. at 3,726 ft.

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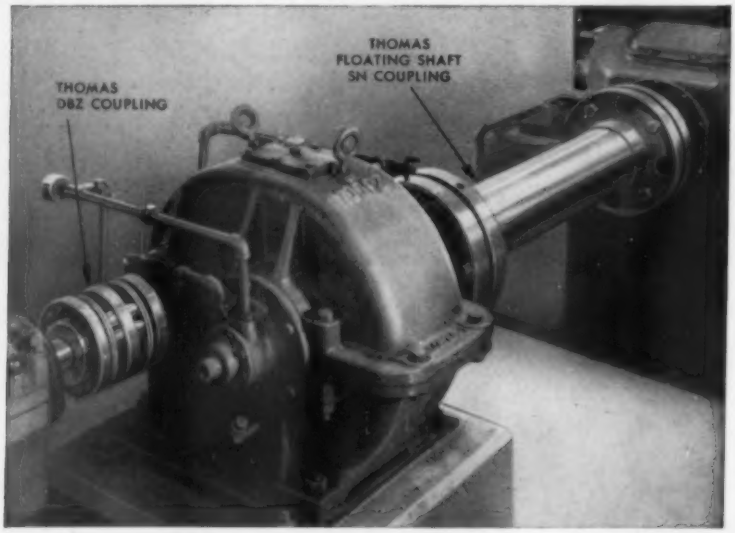

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While this first offset logged Trenton top about flat with the discovery, and oil pay at about the same point of penetration as the discovery, new well did not appear to have as much pay section or as good permeability as the Perry producer. However, the development of an assured successful producer at this first follow-up test was considered to be of great significance to the Michigan oil and gas industry.

Still short of intended total depth, the 1 Houseknecht, NW SE NE 10-5s-3w, was reported to be flowing oil at the rate of 8 bbl. an hour after an increase in pay was drilled between 3,827-33 ft.

OKLAHOMA

SOUTH-CENTRAL OKLAHOMA

McClain and Cleveland Areas Top Sooner Exploration

Continued development of new Pennsylvanian sands, Hunton lime, and Odovician sand discoveries in Cleveland and McClain counties make this one of the nation's busiest drilling locales. There are no signs of any letup in this rapid expansion program in the Norman, Moore, Washington, Wayne, Noble, South Rocky Point, and Lindsay districts.

Washington . . . Goof-Leeper Drilling Co. has an indicated Bromide sand discovery near Washington in McClain County.

The 1 Sasser (B on map), SE SE 8-7n-2w, tested the Ordovician sands at 8,287-8,301 ft. The well flowed at the rate of more than 25 bbl. per hour.

Anderson-Prichard completed the 1 Timms in NE NE 9-7n-3w near Washington for 320 bbl. of oil per day on 10/64-in. choke. Production is at 10,418-35 ft. in the Bromide sand (see A on map).

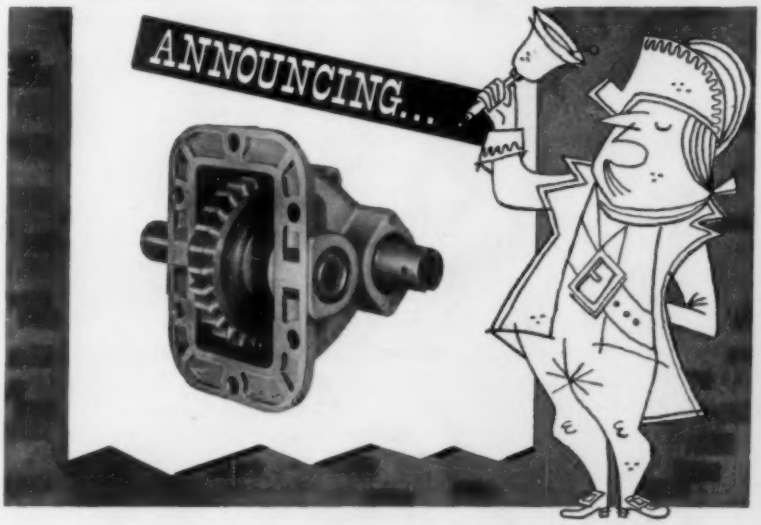
The most important exploratory and development activity in Oklahoma is centered in the south-central counties of McClain and Cleveland. Three prolific pays are being exploited, the Pennsylvanian sands, Hunton-Siluro-Devonian lime, and Ordovician sands.

Wayne . . . Carter Oil Co. 1 Woods, NW NW 14-5n-2w (C on map), flowed 556 bbl. of oil per day from the Hunton lime at 6,992-98 ft. Natural flow was 220 bbl. per day from the Bromide sand at 8,073-94 ft.

Lindsay . . . Sun Oil Co. 1 Burns, SW SW 33-5n-4w (D on map), flowed 613 bbl. of oil in 20 hours, 46° gravity, from Bromide sand perforations at 11,090-11,230 ft. Flow was on ¼-in. choke. This is an important deep prospect for the Lindsay district. Most drilling in here has been to the Hart-Deese (Pennsylvanian) sand.

Northeast Norman . . . T. P. Petroleum Co. and Ward Dayton opened oil production in Cleveland County's Northeast Norman gas field. The 1 Rucker, SW NE SE 8-9n-2w (E on map), flowed 20 bbl. of oil per hour from perforations in the Prue-Pennsylvanian sand at 6,705-31 ft.

South Rocky Point . . . The second well in this new Cleveland County field (F on map), made 50 bbl. per hour from the Bromide sand at 7,460-76 ft. on drill-stem test. It is the Oil Capitol



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Here is one of the most important developments in the Cherokee-Pennsylvanian campaign in northern Oklahoma since the expansion and evaluation of the trend itself 2 years ago. Davon Drilling Co.'s 1 Ginder in NE NW 30-27n-10w flowed 170 bbl. of oil per day on small choke from perforations at 5,174-84 ft. The well has a flow capacity of 420 bbl. daily. Location is about 12 miles south of the westernmost production in the Cherokee Trend fields. Field development at the new Davon discovery is now in progress.

Corp. 1 Fessenbeck in NW NE SE 32-8n-1w. The Tulip Creek - Ordovician sand is to be tested next.

Noble . . . New Noble Townsite field in Cleveland County (G on map) is one of the fastest growing new areas in Oklahoma.

Anderson-Prichard has an extension well in NE NW SW 27-8n-2w that made 800 bbl. of oil per day from Bromide sand and Tulip Creek sand at 7,872-89 ft. and 8,168-73 ft., respectively. The 1 Rollins is located in SW SE NW 27-8n-2w.

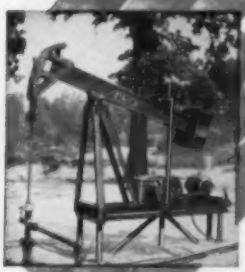
NORTHWEST OKLAHOMA

Harper County Play Moves East of Laverne

This year's exploratory and development interest in Harper County appears to be moving eastward out of the Laverne district where prolific gas pro-

The Pennsylvanian campaign in Harper County, northwestern Oklahoma, is moving to the east of Laverne district.

Pumping their way to Leadership



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duction was developed last year. Focal points of the new play are Woods Petroleum Co. 1 Randall in NE NE 29-26n-22w, and the Southeast Stockholm field (see map).

Woods' 1 Randall wildcat discovery in Harper County flowed 6,500 M.c.f. of gas per day from the Morrow-Pennsylvanian sand at 6,704-17 ft. This moves Morrow production in this County to its easternmost point, and in a line with the indicated northwest-southeast Morrow trend that is building up in northwestern Oklahoma (see Woodward field on map).

Eason Oil Co. and Wilcox Oil Co. have a prolific new Tonkawa-Pennsylvanian sand oil and gas area at Southeast Stockholm. The 1 Crawford in SW NE 17-26n-23w, flowed 6,000 M.c.f. of gas per day from perforations at 5,425-49 ft. The 1 Price-Palmer in NW NW 28-26n-23w, flowed 20 bbl. of oil per hour from the Tonkawa at 5,534-79 ft.

Laverne . . . In the Laverne district Gulf Oil Corp. has an indicated new pay sand for the area at its 1 Hicks, NE SW 7-26n-24w. The Wabaunsee-Pennsylvanian yielded 4,000 M.c.f. of gas in 30 minutes of a drill-stem test at 4,242-4,325 ft. The Wabaunsee is at the top of the Virgil series at the top of the Pennsylvanian.

Woodward County . . . Further indications of the coming Morrow sand era in this new producing county in Oklahoma are the developments going on near the city of Woodward. Champlin Oil & Refining Co. is testing gas in the lower Morrow sand at its 1 McDonald in C SE NW 1-22n-21w, just south of town. The well flowed np to 6,110 M.c.f. of gas per day on 19/64-in. choke from perforations at 8,256-61 ft. Several other tests on various chokes gave up good gas flows. Successful completion of the wildcat would give the county its second field and also add another link to the chain of Morrow fields near the shelf of the Anadarko basin.

SOUTHWEST OKLAHOMA

Knox Deep Pays Its Way

Here are the cumulative production figures on British-American Oil Producing Co.'s two deep producers in ultra-deep Knox field, Grady County, the state's deepest producing area, and currently one of the most active fields.

The 2 Harrison well, completed in the winter of 1956, has yielded 358,132 bbl. of distillate and 2,527,000 M.c.f. of gas from the Third Bromide sands at 15,250-15,310 ft. through open hole.

The latest addition to the producing wells is the 1 Reid, a 1957 discovery in SW SW NE 20-3n-5w. This one has

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produced 13,392 bbl. of distillate and 92,000 M.c.f. of gas in a month's time. This well is the deepest producer in the State of Oklahoma at 15,575-15,645 ft. in the Third Bromide sand.

ROCKY MOUNTAIN

MONTANA

Outlook Area Wildcat Flows Red River Oil

The 1 Loucks, Amerada Petroleum Corp.'s Outlook area wildcat in Sheridan County, northeastern Montana, flowed 194 bbl. of oil, cut 10 per cent water in 13 hours on test of the Red River-Ordovician at 8,896-9,916 ft.

Location of this new pay prospect for the region is in C NE SW 35-36n-52e, 4 miles southwest of the field discovery well, 1 Tange. That discovery flowed oil from the Silurian.

TEXAS

WEST TEXAS

Devonian Find Completed In Eastern Crane County

The eastern portion of Crane County has a new Devonian oil discovery. The well is Evans Production Corp. 1 Dawson, 10 miles south of Crane townsite in Section 82, Block X, CCSD&RGNG Survey. The well made 480 bbl. of 38°-gravity oil in 24 hours plus 50 per cent water on 1-in. choke from Devonian perforations at 5,605-40 ft. Location is 1½ miles southwest of Crane Cowden field.

TEXAS GULF COAST

May Area Production Jumps Three Miles

Arkansas Fuel Oil Corp. has another major-extension discovery in its widely spreading, multiple-pay May area in southeastern Kleberg County.

It is the company's 1 E. R. Reitsch, 3 miles southeast of nearest existing production. Location is just west of Rivieria Beach, on Baffins Bay, near the Kenedy County line.

A preliminary drill-stem test after perforating casing opposite the prospective new pay at 6,668-83 ft. recovered 1,000 ft. of 65°-gravity condensate. Tester was open 4 hours through ¼-in. chokes, getting the 1,500-ft. water cushion to top in 14 minutes, and gas in 26 minutes.

With top choke changed to 5/32-in., working pressure was 1,224 psi. It increased to 1,360 psi. through ⅛-in. choke. Bottom-hole pressures were 2,900 to 2,940 psi., flowing, and 3,015 psi., shut in.

First production in the area, located several miles north of older Sarita field (discovered in 1948) on the Kleberg-Kenedy line, was in July 1955. Eight oil and gas wells have been completed with pay zones ranging in depths from 6,900 to 9,350 ft.

Across the line in northern Kenedy County, Delhi-Taylor Oil Corp. and Mayfair Minerals, Inc., have a gas-condensate well in their 2 McGill Ranch. It is good for 11,000,000 cu. ft. of gas and 32.6 bbl. of 65.3°-gravity condensate per day, open flow, from Frio pay at 8,256-65 ft. It is 2,500 ft. southeast of the area's discovery well, completed by Atlantic Refining Co. in 1947 from gas sand at 7,676-80 ft. No other wells have been drilled.

Successful Wildcats

WEST TEXAS

Andrews County: Drilling & Exploration Co. 1 University Land, 19 miles west of Andrews in Sec. 14, Blk. 12, University Lands Sur. ½ mi. NE of Block 12-Ellenburger field. IPF 282 BOPD, Devonian 8,086-8,102 ft. 46.2°, GOR 1855:1. TD 10,410 ft. New oil discovery.

Crane County: Gulf Oil Corp. 477 W. N. Waddell, Sec. 15, Blk. B-27, PSL Sur. IP 4,300 M.c.f. of gas per day, McKee 5,870-5,928 ft., GOR 147,000:1. TD 5,970 ft. 20 miles NE of Crane. New gas discovery.

Kent County: Hack Drilling Co. et al 3 W. R. Ross, 8 miles SE of Guthrie in Buzzard Peak field. IPP 69 BOPD, 37°, lower Tannehill sand 2,683-83 ft. TD 2,807 ft. New pay in field.

Ward County: Wilson Exploration Co. 1-38 New Era Royalties Co., 7 miles SE of Mentone in Sec. 38, Blk. 1, W&NW Sur. IPF 242 BOPD. 32.8°, Delaware 4,765-78 ft. TD 4,966 ft. New oil discovery.

NEBRASKA

Cheyenne County: Murfin & Sutton Drilling Co. 1 Young, C NW NE 12-16n-53w. IPP 50 BOPD, "J" sand discovery, new field. TD 5,653 ft. Skull Creek.

UTAH

San Juan County: Davis Oil Co. 1 Navajo "A," C NE NE 27-41s-24e. IPF 1,680 BOPD, Paradox discovery, new field in Paradox basin. TD 5,590 ft. Paradox.

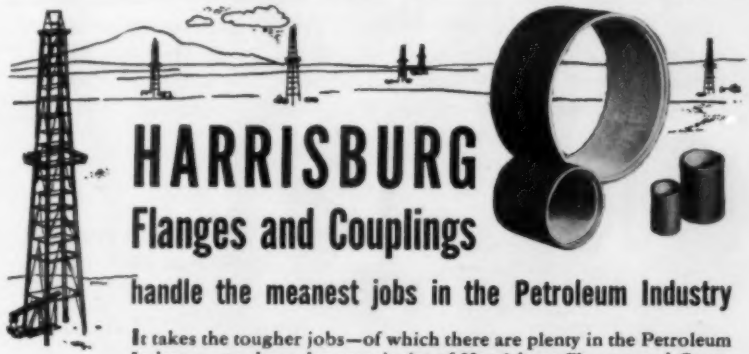
COLORADO

La Plata County: Northwest Production Co. 3-18 Ignacio 34-8, NE SW NW 18-34n-8w. IP 52 M.c.f. of gas per day, Farmington discovery, new field. TD 5,224 ft. Point Lookout.

CALIFORNIA

Ventura County: W. R. Oil Co., 4 Bailey, 12-4n-23w, 50 BOPD, 20.7° gravity, 5 per cent cut, perfs. 1,172-1,527 ft., TD 1,540 ft. (New fault block discovery in Lion Mountain area of Ojai field.)

Kern County: Richfield Oil Corp. 21 Leutholtz, NW NW 22-11n-23w, 175 BOPD, 28.6° gravity, 1 per cent, perfs. 4,138-



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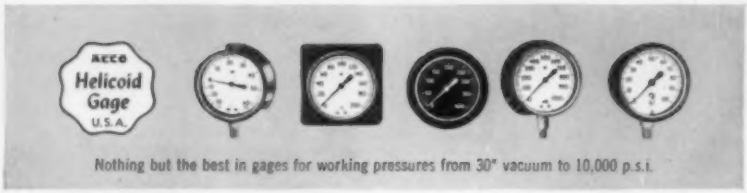

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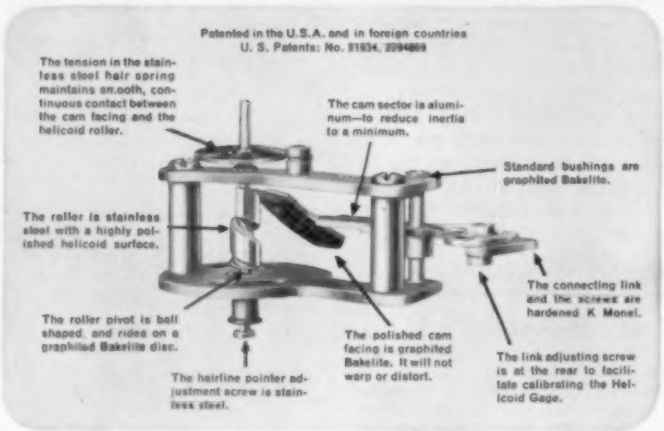
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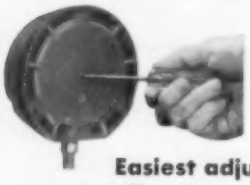

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OKLAHOMA

Alfalfa County: Davon Drilling Co. 1 Ginder, NE NW 30-27n-10w. IPF 204 BOPD, 35° gravity, basal Pennsylvanian-Cherokee sand 5,174-84 ft. TD 5,327 ft.

Beaver County: Ambassador Oil Co. 1 Overton, C NE SW 5-3n-26eCM. IP 1,750 M.c.f. of gas per day, Tonkawa sand 5,357-69 ft.; Morrow sand 7,154-80 ft. TD 7,465 ft.

Phillips Petroleum Co. and The Texas Co. 1 Blakemore, C NW SE 36-4n-20eCM. IPF 478 BOPD, 36.1°. 180 M.c.f. of gas per day, Chester-Miss. 6,542-63 ft. TD 8,414 ft.

Comanche County: Keith E. Walker 1 Fulton, NE 10-4n-11w. IPF 43 BOPD, 41° gravity. Tulip Creek sand 2,144-84 ft. TD 2,506 ft. New pay in South Apache field.

Garfield County: Olson Oil Co. 1 Isbell, NE NE SE 23-20n-3w. IPF 6 BOPD, Miss. 5,431-45 ft. TD 6,162 ft. Opens West Lucien field.

Lincoln County: Nadel & Gussman 1 Von Deylen, NE NE SE 7-16n-6e. IP 8,000 M.c.f. of gas per day, Prue sand 3,056-74 ft. TD 3,105 ft.

Payne County: Moore Drilling Co. 2 Chas. E. Johnston, NW SW SW 19-18n-5e. IPF 20 BOPD, 70 BWPD, 41° gravity, Prue sand 3,084-96 ft. TD 3,419 ft. New pay in Broyles field.

Osage County: A. G. Oliphant 1 Bennett, SW 3-25n-5e. IPF 124 BOPD, 336 BWPD, 40° gravity, Miss. 3,087½-98½ ft. TD 3,450 ft.

Stephens County: Carter Oil Co. 1 Booth, NW NE 22-2n-8w. IPF 74 BOPD, 33.7°, 360 M.c.f. of gas per day, Briscoe 8,181-8,211 ft. TD 8,515 ft. Extends West Marlow pool.

KANSAS

Barton County: Petroleum, Inc., 1 Hammeke "A," SE NW SW 13-19s-12w. IP 962 BOPD, 43°, Lansing-Kansas City 3,098-90 ft. TD 3,430 ft. Opens East Cheyenne View pool.

Ellis County: Bankoff Oil Co. 2 Ruder, C S½ SW NW 4-15s-18w. IPP 85 BOPD, 62 per cent water, 30°, Arbuckle 3,619-28 ft. TD 3,628 ft. Opens North Ruder pool.

Coppinger Drilling Co. and T&M Drilling Co. 1 Sourlook, SE SE SE 20-15s-16w. IPP 215 BOPD, 32.5°, conglomerate 3,431-36 ft. TD 3,485 ft. Opens Sourlock pool.

Graham County: Birmingham & Bartleett and Woodman & Iannitti 1 Nicholson, SE SE SE 10-9s-24w. IPP 397 BOPD, 41°, Lansing-Kansas City, 3,960-65 ft. TD 4,032 ft. Opens Southeast Holley pool.

Kiowa County: Gulf Oil Corp. 1 Phillips, NE NW SW 15-28s-16w. IPP 15 BOPD, 4 BWPD, 34°, Cherokee and Miss. 4,702-32 ft. TD 4,825 ft. New pay in Wellsford pool.

Morton County: Pan American Petroleum Corp. 1 Murphy, NE NE SW 16-31s-41w. IP 8,227 M.c.f. of gas per day, Morrow 5,362-72 ft. TD 5,481 ft.

Norton County: Cities Service Oil Co. 1 Archer, SE SW SW 12-5s-22w. IPP 57 BOPD, 1 per cent water, 24°, Reagan sand 3,543-48 ft. TD 3,585 ft. Opens Densmore pool.

Rooks County: Skelly Oil Co. 1 Arpin, NE

NE SW 5-9s-20w. IPP 183 BOPD, 24°, Arbuckle 3,655-76 ft. TD 3,678 ft.

Rush County: Natural Gas & Oil Co. 2 Williams B, SE NW SW 16-19s-20w. IPP 368 BOPD, 37°, Miss. 4,400-04 ft. TD 4,416 ft. New pay in Southwest Web pool.

Sedgwick County: Derby Refining Co. 1 Derby Refining Co., SE 4-27s-1e. IPP 123 BOPD, 63 per cent water, 37.6°, Viola 3,325-29 ft. TD 3,487 ft. Opens Wichita pool.

Stafford County: Hilton Drilling Co. 5 Bauer, SE NE SE 32-21s-14w. IPP 205 BOPD, 28°, Lansing-Kansas City, 3,584-90 ft. TD 3,878 ft. New pay in Radium Townsite pool.

Petroleum, Inc., 2 Ericksen "B," SW NE SE 8-22s-11w. IPP 80 BOPD, 1 per cent water, 34.8°, Arbuckle 3,517-66 ft. TD 3,606 ft. New pay in Northwest Shepherd pool.

ARKANSAS

Sebastian County: Stephens Investment Co. 1 Allen Unit, SW 30-8n-31w, IP 27,000 M.c.f. of gas per day, Hale 5,392-5,414 ft. TD 5,515 ft. New pay in Massard Prairie pool.

ILLINOIS

Adams County: G&W Oil Co. 1 Binson, NW NW NW 10-3s-5w. IP 218 M.c.f. of gas per day, Silurian 416-22 ft. TD 425 ft. Opens Beverly gas pool.

Christian County: Melvin Fesser 1 Vernon Clark, NW 14-13n-4w. IPP 160 BOPD, Silurian 1,814-22 ft. TD 1,826 ft. Extends Sicily pool.

Jefferson County: Nash Redwine 1 Jefferson Oil & Gas, SE SE SW 26-4s-2e. IPP 120 BOPD, 4 BWPD, St. Louis 3,043-54 ft. TD 3,287 ft. Extends Ina pool and new pay discovery.

Perry County: E. A. Oberling 1 Kaul, NE NE NE 10-4s-2w. IPP 25 BOPD, 26 BWPD, Trenton 3,965-67 ft. TD 4,043 ft. Opens Turkey Bend pool.

Saline County: Walter Duncan 1 Roy Jones, NW NE NE 10-8s-6e. IPF 135 BOPD, Rosiclare 3,023-34 ft. TD 3,110 ft. Extends Raleign pool.

Mt. Carmel Drilling Co. 1 Martok, NE NW NE 34-8s-7e. IPP 70 BOPD, Cypress 2,512-34 ft., 2,543-2,612 ft., McClosky 2,918-24 ft. TD 3,023 ft. Opens Grayson pool.

Williamson County: Phillips Petroleum Co. 1 Madison Coal Co. "A," NW NW NW 6-8s-4e. IPP 20 BOPD, 27 BWPD, Aux Vases 2,933-49 ft. TD 3,180 ft. Opens North Cornith pool.

KENTUCKY

Breckenridge County: Winmar Oil Co. 2 Wm. Fuqua, 6-N-36. IPP 10 BOPD, Benoist 330-51 ft. TD 351 ft. Opens Rockvale pool.

Christian County: Skiles Oil Corp. 1 A. J. Taylor, 15-G-26. IPP 14 BOPD, O'Hara 689-94 ft. TD 697 ft. New pay in Clark pool.

NORTH LOUISIANA

Claiborne Parish: T. L. James & Co. 1 Scaife, C NW 28-22n-5w. IPF 132 BOPD, 40.7°, Cotton Valley-Sexton sand 8,981-86 ft. TD 10,758 ft. New pay in Antioch pool.

Ouachita Parish: Pan American Petroleum Corp. 1 Parker, C NW SE 5-17n-3e. IP 1,270 M.c.f. of gas per day, Cotton Valley "D" sand 9,366-9,400 ft. TD 9,931 ft. Opens West Monroe pool.

NORTH TEXAS

Knox Connty: Anderson Petroleum Co. 1 Mrs. Cora Lee Plumlee, 2½ miles north of Munday in southeast part of county, 1 mile north of Voss Tannehill in Sec. 128, Blk. 45, H&TC Sur. IPP 56 BOPD, 35°, Tannehill sand 1,908-21 ft. TD 2,112 ft. New oil discovery.

Smith & Bryer 1 Joe Davis, 4 miles NE of Knox City in D. G. Burnett Sur., Lot 3, 1 mile west of Tannehill production. IPP 68 BOPD, 39°, Tannehill sand 2,983-86 ft. TD 2,132 ft. New oil discovery.

Wise County: Daniel Peterkin, Jr., et al 1 F. R. Floyd, 1 mile southeast of Chico in W. H. Hersee Sur. A-410. IPF 312 BOPD, ¼-in. choke, 43°, 5,537-44 ft. TD 5,758 ft. New oil discovery.

WEST CENTRAL TEXAS

Coleman County: Champlin Oil & Refining Co. 1 G. A. Crosswell et al, 5 miles northeast of Novice in Sec. 94, Blk. 2, GH&H Sur. IPF 127 BOPD, 3/16-in. choke, 39.4°, Gray sand perfs. 3,372-76 and 3,377-78 ft. TD 3,538 ft. New oil discovery.

Jones County: Texas Grande Oil & Exploration Co. 1 J. W. Griffith et al, 5 miles west of Lueders in Sec. 6, OAL Sur. IPP 144 BOPD, 41°, King sand top pay 2,193 ft. TD 2,198 ft. New oil discovery.

Taylor County: Sojourner Drilling Corp. 1 Dick Atkins, 5½ miles northeast of Tuscola in Sec. 2, Blk. 1, SPRR Sur. IPF 146 BOPD, ⅜-in. choke, 40°, Flippen sand top pay 2,146 ft. TD 2,153 ft. New oil discovery.

PENNSYLVANIA

Indiana County, Armstrong Township: James Drilling Co. 1 W. A. Uncapher, 1,013,000 cu. ft. gas after fracture. Tully 6,870 ft., Onongada 7,515 ft., chert 7,530 ft., Oriskany sand 7,685 ft., gas. TD 7,720 ft.

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...Not This

IMPROPERLY BULLDOZED TRAIL on a downhill slope. All topsoil was removed and a perfect starting place for erosion was made. This trail should have been dammed crosstrail and reseeded.

These two pictures show how . . .

Proper Trail Bulldozing Prevents Soil Erosion

by W. L. Hurt

A SERIOUS public-relations problem is facing oil men in the Rocky Mountain area. Ranchers and conservation men there are very concerned about the amount of damage that has been and will be done to the range country by seismograph crews using bulldozers. Their concern is so great that they may soon initiate legislation controlling the use of this heavy equipment on public lands.

Author is with Sohio Petroleum Co., New Iberia, La.

As the search for petroleum increases in intensity, more and more of the undeveloped land in the Rocky Mountain province is being closely surveyed. Ahead of the trucks bringing the exploration team to the field is the trail-making bulldozer. Hundreds of thousands of acres are crossed and recrossed by seismic and gravity crews and some unavoidable damage is done. But of far more importance is the large amount of avoidable damage that takes place. This unnecessary destruction has resulted in the closing of thousands of privately owned acres to further exploration work involving a bulldozer.

Damage suits by the score have been filed by individuals against the oil companies. And these are fought in the public eye or settled at considerable expense out of court. Government agencies have taken some punitive action and threaten more. A movement is afoot to have government supervisors, similar to the state agents on crews operating in Louisiana, placed on all seismic crews using bulldozers on public domain. The oil industry is giving itself a black eye in the minds of the people of this area—people that elect senators and representatives to go to Washington, D. C., who will, among other things, vote on legislation involving the oil business.

Acute situation . . . This situation becomes more acute with the passing of each spring, when melting snow reveals new damage. This spring might be a good time for the oil men to examine this problem and see if they can find a solution to it. Here is a golden opportunity for the oil business to prove again its good faith by solving a serious problem before it becomes too serious; serious enough to warrant governmental control, big enough to provide a springboard for bad newspaper publicity.

Bulldozing necessary . . . There are two primary reasons for using a bulldozer in the Rockies. The first and most important is the need for a system of roads and trails into and through the area to be surveyed. The second reason, often inseparable from the first, is the need for heavy equipment to clear snow from access roads and survey lines, allowing the crew to search for oil the year around. Ranchers and conservation men are aware of both of these reasons for using a bulldozer on the open range; and they are sensible enough to realize that a trail can't be built across virgin country without doing some damage to the rangeland.

In most cases the complaints, and damage suits, have not been based on damages done in the course of a normal bulldozing operation conducted in a conservationwise manner, but rather, these complaints have arisen from improper, unnecessary, and excessive bulldozing. A lack of understanding is present on both sides. Oil men are

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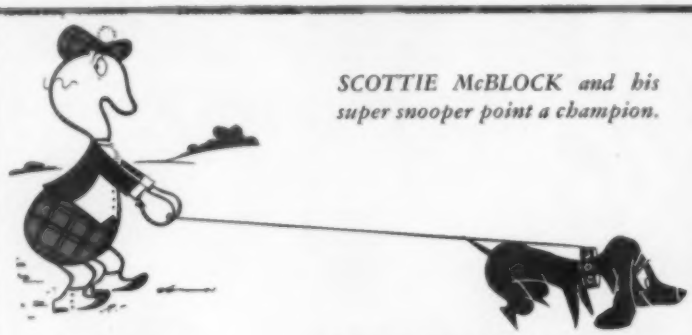
LEVEL-GROUND TRAIL that was bulldozed improperly. Water will eventually start damaging erosion. Vegetation will not recover this trail within our lifetime.



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often not aware of the value of the range being crossed; and some view it as worthless, waste land valuable only for its oil potential. On the other hand, ranchers and some conservation men don't understand why a seismic crew must operate the way that they do. It isn't too unusual to find a rancher who doesn't know a seismograph crew is part of an oil-finding team. Since the ranchers and conservation men control the surface of the land in this area, the conduct of a seismic survey is dependent upon their good will. The oil men must find out the value of the land they are crossing. The oil man must explain why he wants to do some things. And it is up to the oil man to listen to the rancher's requests concerning the location or lack of location of shot-holes in certain places.

If the oil industry wants to continue to explore this region unhampered by the permit problems prevalent in other areas, a meeting of the minds must be reached between the oil man, the ranchers, and the conservationists. And the oil industry should take the first steps toward the meeting place.

Party chiefs and field managers of seismic crews have been aware of the growing opposition to the use of a bulldozer for some time, and have been handling individual problems on an on-the-spot basis as a regular part of their jobs. There is a natural tendency to regard this problem as minor, perhaps even to regard it as being confined to individuals and to consider it a spot problem. However, the amount of seismic activity has increased tremendously in recent years.

The size of this problem has grown with the number of crews working in the province. The amount of damage already done staggers the imagination. The reason that it has received relatively little notice thus far is that the damaged areas, as long as there are just a few of them, can be so easily swallowed in the vast open reaches of the West. With the upsurge in seismic activity in this region, the problem of 'dozer damage became more difficult to swallow. Now it is definitely an area problem, but it is still solvable if the oil industry makes a concerted effort.

Work through agency . . . One of the best reasons for believing this situation can be quickly handled is the presence throughout the area of two government agencies. These agencies, the Bureau of Land Management and the Soil Conservation Service, work directly with farmers and ranchers living in the Rocky Mountain empire. They cooperate closely with the county agents and with the local and state conservation groups. They are ready to cooperate with the oil industry if the oil industry shows a desire to cooperate

with them. However, they are also ready to criticize, and have the authority to chastise the industry if the destruction of the natural resources under their protection continues.

Only recently the Bureau of Land Management met with an association of oil and gas producers of the area to set up a code of ethics governing the conduct of seismic field crews working in the Rockies. This code was to be used by the crews as a guide to good conservation practices. It was also designed to further good public relations with the people contacted by the crews.

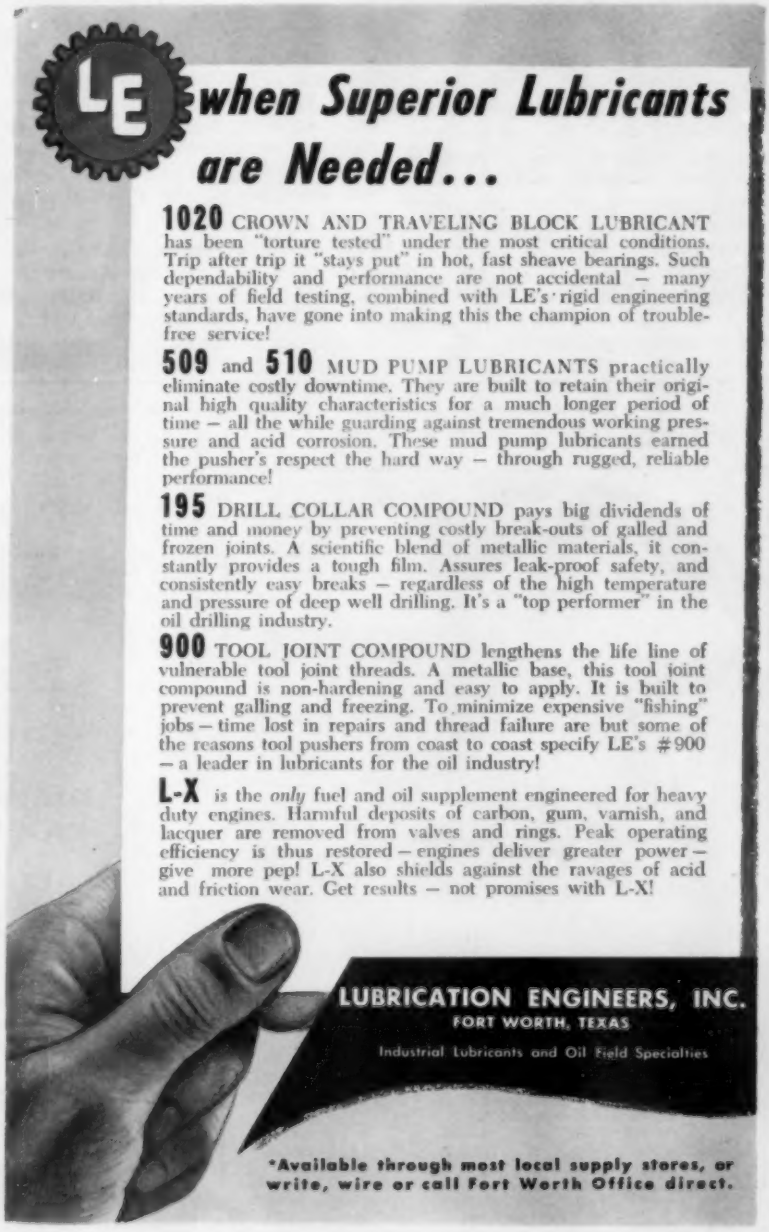
The idea is excellent, and the code that was developed during this meeting was a good one. What happened to it no one seems to know. Very few of the party managers now working in the area are aware of its existence. Somewhere this splendid cooperative effort went astray. With one company it went so far astray that instead of encouraging cooperation between the seismic crews and the conservation people, the party chiefs were advised to stay away from the government offices and tell them as little as possible. That kind of policy is about the best and fastest way to antagonize the Bureau of Land Management and other responsible agencies that has been devised. Bear in mind that the Bureau of Land Management administers all public domain in this country, and also remember that Wyoming, for example, is about 90 per cent public domain.

The industry must cooperate with these agencies or create new problems for itself. The conservation groups would like to see the oil industry solve the damage problem by itself, and will help the oil men as much as possible. They would much rather cooperate with the oil industry at the request of the industry than have to take steps to force the industry to cooperate with them whether it wants to or not.

The services of these conservation agencies that are applicable to seismic exploration are few but they are valuable. The area conservationist is a well-qualified man with an intimate knowledge of the area assigned to him. He knows the terrain, the trails, and the water holes. A few minutes conversation with him could well save a crew time and money, since he can provide up-to-date information about the location of trails and access roads, ground conditions, drilling water, and privately or publicly owned tracts that require special permitting or handling. He may be able to show the party manager how to cut down on the amount of bulldozing necessary to the seismic survey; and he is also able to tell the party manager the things that should be known before the bulldozer is used on any prospect.

The area conservationist knows, but the oil man seldom does, when a fill across a gully should be left as a check dam to assist in erosion control and when the fill should be breached after its usefulness to the crew is ended. A fill that should have been breached but wasn't can cost the price of a herd of sheep—drowned sheep. In some areas sagebrush is undesirable and the range is better off without it, provided it is properly removed. In other areas, usually in the lower elevations, sagebrush is valuable as winter forage and is often the only food for a herd of sheep on winter range. Bulldozing in the latter areas should be held to an absolute minimum. The area conservationist, regardless of his title or of the agency with which he is associated, is a good man to know and work with. Cooperation with him requires only a small investment of time, but that investment can pay a very large return.

Plan bulldozing operations . . . Improper bulldozing, excessive bulldozing, unnecessary bulldozing—vague terms to define. How much, what kind, and where bulldozer work should be done must be decided by the oil man who knows his equipment and the needs of the survey to be done. Talking things over with the ranchers and conservation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men before bulldozing operations are done will often prevent future misunderstandings, especially if the work is being done in the winter months when snow obscures existing trails. Nothing is more irritating to a rancher or range manager than to see two parallel bulldozed trails 40 or 50 ft. apart, unless it is seeing a bulldozed trail straightening out an existing road.

Portable cables and light geophones now commonly in use allow spreads to be straightened out by allowing them to be walked out, while the trucks move from shotpoint to shotpoint via the established and winding, roads. This practice, used where possible by some crews but not all of them, saves tempers and bulldozer fees. The ranchers and conservation men will gladly tell crews where existing roads are located.

It is interesting to note that a seismic survey covering one township with a mile square grid requires some 98 miles of bulldozed trail. The rancher who owns this mythical township stands to lose almost a quarter of a section of pasture just from the bulldozing alone —far more if the 'dozed trails become a focal point for erosional loss. Under average conditions 8 to 10 miles of bulldozed trail can destroy enough forage to have provided 50 to 90 lb. of beef or mutton per season.

This same rancher with the township-sized ranch providing his living stands to lose 700 to 900 lb. of beef or mutton per season as payment for allowing a seismic crew to survey his land. Frequently he is in a position where he stands no chance of realizing any return in the form of royalties, even if the crew finds a structure on his place. No wonder he turns permit men away.

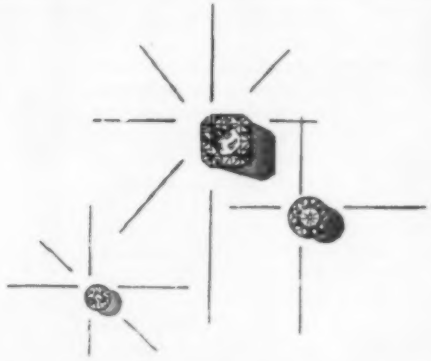
Several things can be done by the crew that first works this mythical township, acts that will minimize this loss and treat the rancher more fairly. Skid shoes can be placed on the bulldozer blade; thus the blade can clear brush but not topsoil, leaving the grass roots in the ground so that vegetation can recover quickly. If the range is used for cattle, many people believe that this kind of bulldozing helps more than it harms. Another thing that is a major help in restoring damaged range and controlling erosion is a reseeding program, conducted by the oil company or seismic crew with the advice and assistance of the area conservationist.

Reseeding of seismic trails is not as expensive as it may sound, since the government subsidizes a program of that nature by furnishing seed and favorable tax writeoffs. It can only be done during certain parts of the year, however. When trails have been damaged badly it is often best to repair them while the bulldozer is in the area.

If the seismic field manager and the area conservationist are working together it is a relatively simple matter for them to periodically inspect trails that are no longer being used. Notes can be made regarding locations where crosstrail damming, filling and reseeding of cuts, and breeching of fills should be done. On those days when the bulldozer is not busy making trail or pulling vehicles these constructive jobs can be done.

Bulldozed trails cut straight down hillsides are natural channels for meltwater and rain runoff. The vegetation having been removed there is nothing to hold and disperse the water; it shoots off down the hillside, taking a big bite of loose soil along. Trails like this soon become wide gullies, no longer recognizable as roadways. This can be stopped by crosstrail damming every 100 or 200 ft., with reseeding as needed, done when the trail is abandoned. These things help repair the damage that the oil industry must do in order to find more petroleum, and these things stand as visible evidence that the industry is trying to be a good neighbor.

THE OIL AND GAS JOURNAL



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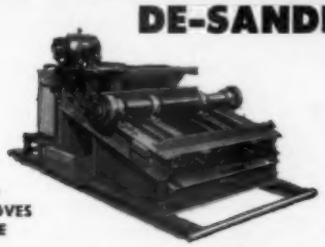

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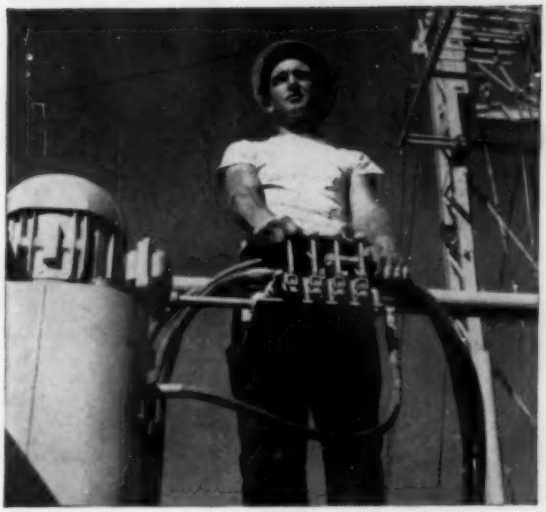

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In getting Amoco workers . . .

Hopkins Wraps up Tough Job

THE best known former Texan in the Lower Virginia Peninsula must be Mark Hopkins, manager of American Oil Co.'s new refinery at Yorktown.

During preliminary work and while the plant was under construction he spoke before 36 local organizations to let the people of the lower peninsula know what the refinery would mean to them. His assignment was to gain their confidence, to learn about the area, and to have the area learn about Amoco.

Success is shown by the fact that he has been elected a director of the Peninsula Chamber of Commerce, the Peninsula Industrial Committee, and the Dixie Hospital.

Hopkins has put a lot of emphasis on the job of hiring and training men to operate the 35,000-bbl. refinery, which will be dedicated this week (see page 82). Before the first units went on stream last December, an intensive screening and training program was completed.

Applicants were screened as to age and education. As a result, no employe is less than a high school graduate except those who have received Hopkins' personal approval.

Training . . . Local workers with no previous oil experience make up 80 per cent of the work force. Not one of the employes hired locally or those transferred to Yorktown was put on the pay roll without his supervisor's approval.

The lack of oil experience on the part of the local employes was overcome with a thorough training course. The course had two impressive textbooks, "Supervisors Handbook," for foremen, and "Operators' Training Manual."

The new employes were taught everything from the molecular structure of crude oil to the blending of finished products.

One reason for Mark Hopkins' apparent success in the vitally important field of personnel relations is his ready accessibility. His office door is seldom, if ever, closed. And when you call him on the phone, you may be startled to hear the voice of Hopkins himself.

He's an organizer . . . Getting things under way is not a new experience to him.

Back in 1933 when he was employed by Freeport Sulphur Co. he was one of the first technical men on the scene when the company opened a new mine in Louisiana. He helped set up the company's analytical laboratory, the water-treating system, and much of the technical equipment required in training the crews to operate the water-treating system.

He faced an organizing job of another sort when he and Mrs. Eloise Parker Hopkins moved to Texas City after he joined American. The Hopkins found there was no Presbyterian Church in the community so they joined a small group determined to organize a congregation.

They canvassed the town, going from door to door. In 1941 they organized a church with a charter membership of 22. When they left Texas City, membership had grown to 500 and, on a recent visit, the Hopkins found it was still growing.

Native Texan . . . Hopkins was born in Dayton, Tex., August 3, 1909. He gained his early education in Dayton and Beaumont, Tex., and Monroe, La. He graduated from high school in Houston and received a B.S. degree in chemical engineering from Rice Institute in 1931.

His first job after graduation was as a chemical engineer in the Freeport Sulphur Co. laboratory. In January 1937 he went to work in the research and development department of Pan American Refining Co., which has since become American Oil Co.

In 1947 he was made assistant director of research in charge of all chemical engineering activities, including technical service, process design, economics and product quality. In 1948 he became coordinator, and in 1951, technical director of research and development.

"I am often asked," he says, "how I like Virginians. I always say they're just like Texans, only more so. And coming from a Texan, that's a compliment." This makes it easy to understand why the Hopkins and their daughter, Pat, have made themselves thoroughly at home in Virginia.

R. B. Tickler has been named assistant manager of the Belot, Cuba, refinery of Esso Standard Oil, S.A. Tickler was formerly with Esso Standard Oil Co. in Baton Rouge, La.

Claude O. Stephens, vice president and general manager of production for Texas Gulf Sulphur Co., has been elected president of the firm. He succeeds **Fred M. Nelson,** who has been named chairman of the board. Nelson will remain chief executive officer.

G. P. GARVER

George P. Garver, vice president and secretary-treasurer of Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co., has been elected president of the firms, both subsidiaries of Peoples Gas Light & Coke Co. Garver succeeds **J. J. Hedrick,** recently elected president of the parent company. **Remick McDowell,** a vice president of Peoples Gas Light & Coke since 1951, has been named executive vice president, a new position. **Mark V. Burlingame,** vice president in charge of operations for Natural Gas Pipeline and Texas Illinois Natural Gas Pipeline, has been moved up to executive vice president of the two companies.

Personals

J. R. Wait, Jr., chief engineer and a director of Houston Pipe Line Co., has joined Coastal Transmission Corp. as chief engineer. **H. L. Wilhite,** petroleum engineer with Delhi-Taylor Oil Corp., Coastal Transmission's parent company, has been appointed manager

J. R. WAIT, JR.

H. L. WILHITE

of gas supply for the pipeline company. **Russell N. Harvey** will be manager of right-of-way. Harvey was with Trunkline Gas Co. before joining Coastal Transmission. Coastal will soon begin construction on the western section of a natural gas system to Florida.

D. P. Barnard, research coordinator for Standard Oil Co. (Ind.), **Hugh W. Field,** vice president and general manager of research and development, Atlantic Refining Co., and **Dr. J. Bennett Hill,** who recently retired as Sun Oil Co.'s director of research and development, will receive certificates of appreciation at the American Petroleum Institute's division of refining meeting May 15 in Philadelphia. The awards recognize service to the A.P.I. and contributions to petroleum technology.

Ralph H. Viney has resigned a position with the First National City Bank of New York to join the First National Bank of Fort Worth as petroleum engineer and assistant vice president.

Weldon E. Williams has been promoted by Champlin Oil & Refining Co. from district engineer to project engineer and transferred to Fort Worth from Oklahoma City.

J. S. Boylan, Continental Oil Co.'s director of safety and chief fire marshal, will receive an American Petroleum Institute certificate of appreciation when the A.P.I.'s safety and fire protection committees meet next month in Kansas City. Boylan has been Conoco's safety director since 1929.

William E. Walton, Jr., has been promoted by Sinclair Oil & Gas Co. from assistant production foreman in Madill, Okla., to district production foreman with Sinclair Canada Oil Co. in Fort St. John, British Columbia. Walton has been with Sinclair since 1951.

Scott B. Houghton, petroleum engineer with N.V. Standard-Vacuum Petroleum Maatschappij in Pendopo, Sumatra, has been promoted to special assistant to the head of the production department. **George L. Dean,** petroleum engineer II, has been appointed petroleum engineer I and will head the development and production sections of the petroleum engineering department.

J. V. Bonds, exploitation engineer in Shell Oil Co.'s Houston production department, has been transferred to Eagle Lake, Tex.

W. F. Taylor, Shell Oil Co.'s district production foreman of the Panhandle district, Woodward, Okla., has been promoted to district superintendent. Taylor was district production foreman in Elk City, Okla., before transferring to Woodward.

C J. Hale, Jr., Interstate Oil Pipe Line Co.'s operations engineer at Shreveport, La., has been appointed district foreman in the company's Brookhaven, Miss., district. **D. C. McKinley,** senior oil measurement engineer, will replace Hale in Shreveport.

E. C. McGRAW

E. Clyde McGraw, executive vice president of Transcontinental Gas Pipe Line Corp., has moved up to president and chief executive officer of the company. McGraw succeeds **Tom P. Walker,** president since 1953, who has been elected chairman of the board. McGraw joined Transcontinental in 1948 as operating vice president. He has been executive vice president since 1955. He was with Stone & Webster Service Corp. before joining Transcontinental.

Albert Gregersen, staff representative for Eastern Hemisphere production with Gulf Oil Corp., has been elected a vice president of Gulf Eastern Co., a subsidiary. He will transfer to London from Pittsburgh. Gregersen joined Gulf in 1945 as vice president and branch manager of Danish American Prospecting Co., a Gulf subsidiary.

Milo M. Brisco, International Petroleum Co.'s executive representative in Colombia, has been nominated for the company's board of directors. **F. J. Espinosa,** general manager of International Petroleum (Colombia), Ltd., and assistant executive representative in Colombia, will succeed Brisco as executive representative there. Brisco has been with International since 1935. He was general manager for the company in Peru before being named executive representative in Colombia in 1955. Espinosa has been assistant executive representative in Colombia since 1956.

Illinois Group Elects Officers at Annual Meeting

T. N. Duncan, front row left, of N. V. Duncan Drilling Co., Fairfield, Ill., has been elected president of the Illinois Oil and Gas Association. Other officers are, front row, left to right, Duncan; O. F. Beaty, Magnolia Petroleum Co., Mount Vernon, Ill., first vice president; C. R. Collins, Collins Brothers Oil Co., Mount Vernon, secretary; and Homer Rutherford, Rutherford & Co., Mount Vernon, treasurer. Second row, left to right, M. H. Guess, Shell Oil Co., Centralia, Ill., third vice president; Charles J. Pardee, Mount Vernon, executive secretary; and H. L. Brockman, Calvert Drilling, Inc., Olney, Ill., second vice president. Not pictured is Clarence T. Smith, Flora, Ill., general counsel.

A.P.I. Mid-Continent Production Officers Elected

E. E. Young, left, Sohio Petroleum Co., Oklahoma City, is new chairman of the American Petroleum Institute's Mid-Continent district, division of production. Young succeeds F. F. Wright, right, of Sinclair Oil & Gas Co., Tulsa. Wright is now chairman of the district advisory committee. John Terry, Lane-Wells Co., Oklahoma City, is secretary-treasurer of the group. Vice chairmen are J. T. Nutter, Midstates Oil Corp., Seminole, Okla., Seminole-Oklahoma City area; James W. Rockhold, Great Bend, Kans., consultant, Kansas; Charles P. O'Loughlin, O'Loughlin Well Service Co., Perry, Okla., Drumright-Perry area; Fred J. Nesiage, West Pampa Repressuring Association, Pampa, Tex., Texas Panhandle; J. A. Maurer, Mack Oil Co., Duncan, Okla., Southwestern Oklahoma; and Gene Bates, The Texas Co., Maysville, Okla., Golden Trend area.

E. Donald Kaye has left Pan American Petroleum Corp. in Roswell, N. M., to join **Emby Kaye,** Tulsa independent.

K. R. Gerhart, superintendent of Continental Oil Co.'s Chicago petrochemical plant, has been transferred to Gretna, La., as superintendent of operations at the company's Sherwood refinery. **T. J. Karolenko,** assistant superintendent at Conoco's Baltimore petrochemical plant, will succeed Gerhart as superintendent in Chicago.

R. L. Topper, Transcontinental Gas Pipe Line Corp.'s assistant chief engineer, has been promoted to executive assistant to the executive vice president. **Howard L. Cline,** superintendent of compressor stations for the company, has been promoted to assistant chief engineer succeeding Topper. **John C. Boehm,** assistant superintendent of compressor stations, has been named to succeed Cline as superintendent. **F. M. Wright,** superintendent of Transco's compressor division in Charlottesville, Va., moves up to succeed Wright as assistant superintendent of compressor stations. All will have headquarters in Houston.

P. A. Cooper has been promoted by Continental Oil Co. from drilling foreman to senior drilling foreman and transferred to Odessa, Tex., from Denver City, Tex.

Personals

C. A. Swigart, chairman of the board and chief executive officer of Trans-Arabian Pipeline Co., is retiring after over 6 years in the Middle East with Tapline.

J. C. Menefee, chief geophysicist for Mobil Producing Co. in Billings, Mont., has been transferred to New York in the same capacity with Socony Mobil Oil Co. **O. H. Armstrong,** staff geophysicist in Billings, has moved up to succeed Menefee. Menefee has been with Mobil Producing since 1953. Armstrong, former district geophysicist in Bismarck, N. D., has been in Billings since 1955.

W. K. Sanders, vice president of Trunkline Gas Co., has been elected president of the company, a subsidiary of Panhandle Eastern Pipe Line Co. Sanders succeeds **W. G. Maguire,** chairman of the board of Trunkline and of Panhandle Eastern. Sanders has been with the Panhandle system and its predecessors since 1928. He has been vice president of Trunkline since 1950.

B. D. Leuty, manager of pipeline transportation and vice president of Cities Service Pipe Line Co., has been elected president. Leuty has been with Cities Service since 1924. **Harry Nelson** has been named vice president and manager of the pipeline company. Other appointments include **G. R. Preston,** vice president and treasurer; **G. C. Richardson** and **R. E. Roehl,** vice presidents; and **O. W. Bailey,** secretary.

DEATHS

Joseph Winton Pearce, 45, drilling superintendent for Pool & Garlich Drilling Co., San Angelo, Tex., was killed April 15 three miles north of Bronte, Tex., when high winds toppled the derrick of a company rig onto his car.

G. Stewart Brown, 50, manager of public relations for Standard Oil Co. of California and 1955 head of the Oil Information Committee, died April 12 at his home in San Francisco. Brown, who joined Standard of California in 1948, had been in ill health for several months.

Stanley G. Elder, 52, regional geologist in Tulsa for Sun Oil Co., died April 11 in Tulsa.

Palmer Hughes, 66, Mid-Continent representative for M. W. Kellogg Co., died April 15 at his home in Tulsa.

Hugh A. L. Halff, 53, president and treasurer of Blanco Oil Co., San Antonio, died April 11 in San Antonio. Halff had been a director of the Independent Petroleum Association of America, Texas Mid-Continent Oil and Gas Association, and Texas Independent Producers and Royalty Owners Association.

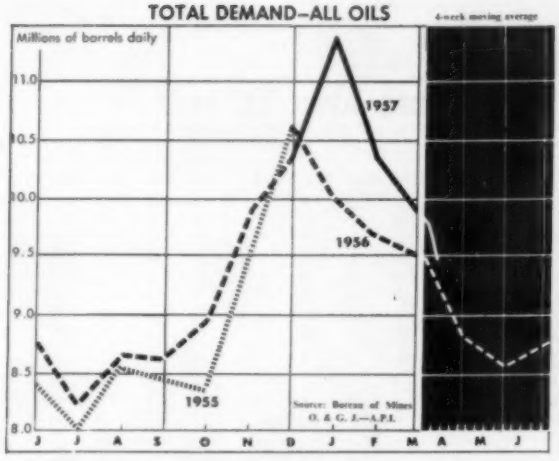
Harry A. Hopkins, 75, pioneer San Joaquin Valley, California, oil man, drowned in a boating accident on the Colorado River recently. Hopkins was a member of the delegation which named the oil town of Taft, Calif.

George L. Noble, 88, Uvalde, Tex., retired vice president of The Texas Co., collapsed and died April 11 while attending a Texas Oil-Timers Club dinner in Houston. Noble retired from Texaco in 1937.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,474,225	DOWN	157,175	UP	310,486
Crude stocks	252,325,000	UP	16,000	DOWN	14,760,000
Completions	919	DOWN	43	DOWN	142
Refinery runs	7,899,000	UP	43,000	UP	348,000
Gasoline stocks	202,904,000	DOWN	406,000	UP	7,845,000
Kerosine stocks	19,823,000	UP	94,000	UP	2,216,000
Distillate stocks	74,156,000	DOWN	1,139,000	UP	13,324,000
Residual stocks	36,758,000	DOWN	836,000	UP	3,970,000
Four-product stocks	333,641,000	DOWN	2,287,000	UP	27,355,000



Group 3 Gasolines Will Have a Wider Spread Between Premium and Regular

MID-CONTINENT suppliers are working on possible gasoline-price schedules that will cover some of the increases in processing costs for the higher-octane premium scheduled for this summer.

Starting on the fifteenth of this month, deliveries to the Great Lakes Pipe Line went up one octane number for both regular and premium grades. After the first of May, premium will be raised another number to give a spread of nine octane numbers between the 89 regular and 98 premium.

Price speculation in the area indicates that regular may move up either an eighth or a quarter of a cent per gallon. The raise probably will not come until the new product is available at all terminals.

Higher processing costs for octane increases in the 98-octane range will require a bigger price spread between premium and housebrand. At the refinery level, the spread has been 1.75 cents a gallon on the Group 3 market. This may climb to 2.5 cents when the 97-octane material is available at all terminals and to 3.0 cents when premium is raised to 98 octane.

While this boost in the differential between housebrand and premium is needed to cover increased processing costs, there is a possible stumbling block. Competition from the Gulf Coast may limit the raise.

Premium gasoline of 98 octane carries a formal quotation of 13.75 cents a gallon on the Gulf Coast for cargo lifting. But, current reports from the area indicate that material is available at 13.25 cents.

Group 3 refiners base their prices from a formal quotation of 12.50 cents for regular, but spot material is available at 11.75 cents. Scattered reports indicate that some spot sales are even under this price. A base price of 11.75 cents for regular plus 3.0 cents extra for premium would result in a Group 3 spot price of 14.75 for premium.

Current barge rates would deliver Gulf Coast premium gasoline to the upper Mississippi River area for a laid-down cost of about 14.40 cents per gallon. Terminal costs would add about another 0.25 cent for a total of 14.65 cents.

On the other hand, pipeline charges, including terminaling costs, would raise the Group 3 base price of 14.75 cents to 16.25 cents.

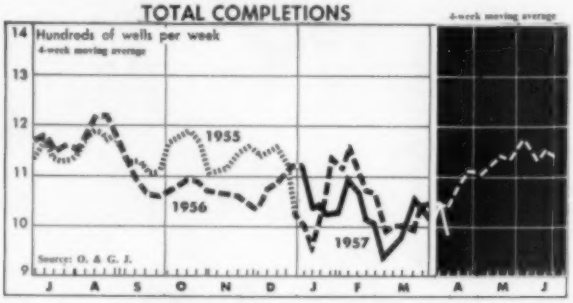
There are several depressing factors in the inland gasoline market. But, a reduction in excess gasoline stocks and some strengthening of the Gulf Coast market would go a long way toward stabilizing Group 3 and North Central gasoline prices.

Some marketers report that cold and rainy weather has tended to delay gasoline sales to farmers in some of the inland areas. However, this movement should be strong by the time Group 3 prices are adjusted to cover higher-octane material.

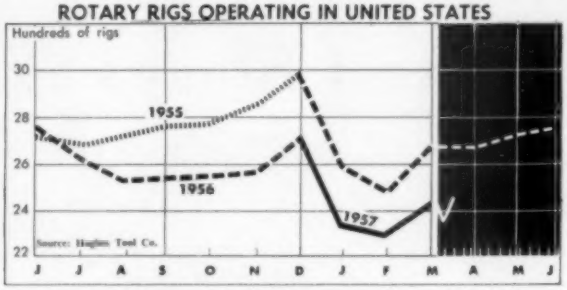
Rotary-rig total is up . . . According to the weekly survey by Hughes Tool Co., the number of rotary rigs operating in the United States climbed to 2,465 by the middle of April. This total represented a gain of 102 rigs over the previous week but was under last year's total by 222 rigs.

Reported rotary rigs averaged 2,358 for the first 15 weeks of this year compared with 2,628 for the same period in 1956. Since total completions for the first quarter dropped only 669 wells under the first 3 months of 1956, the big reduction in operating rigs indicates more well completions per rig this year than last.

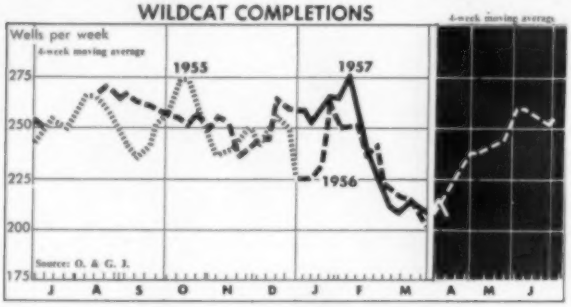
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	4-15-57	4-8-57	4-16-56
North Central and East	70	71	97
Southeast	47	47	32
Okla., Kans., Ark., Mo.	421	347	521
Louisiana	420	416	428
North and East Texas-Panhandle	429	416	434
Gulf and South Texas	230	225	258
West Texas-New Mexico	560	555	555
Rocky Mountain	195	192	227
Pacific Coast	91	92	133
Total United States	2,463	2,361	2,685
Western Canada	108	130	108

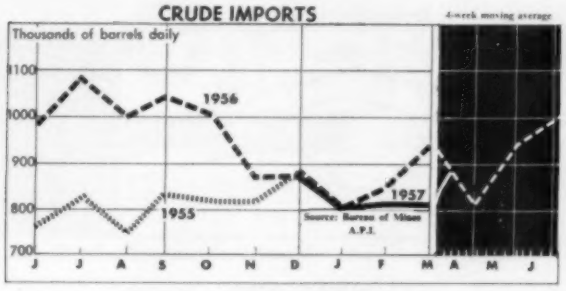
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 13, 1957

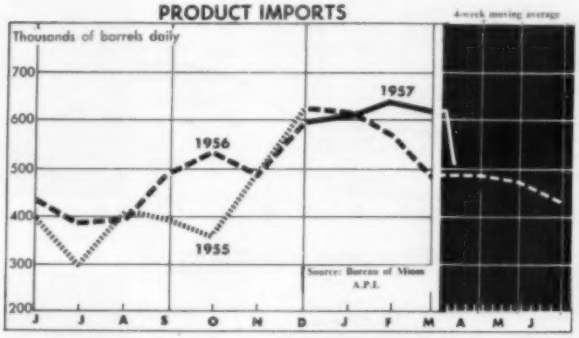
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1957				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	†3	2	0	1	27,815	33	29	0	0	0	1	1	0	0	1	13	14
Arkansas	11	9	0	2	32,445	286	215	0	0	0	2	2	5	0	1	38	44
California	36	24	1	11	146,937	552	596	0	0	0	7	7	12	0	2	129	143
Colorado	9	2	0	7	44,838	276	311	1	0	0	6	7	11	0	3	173	187
Illinois	30	16	0	14	72,481	654	932	0	0	0	3	3	7	0	1	151	159
Indiana	20	4	0	16	33,545	182	177	0	0	0	7	7	3	0	0	37	40
Kansas	63	20	4	39	228,715	1,238	1,431	1	0	0	14	15	35	0	8	184	227
Kentucky	36	19	3	14	49,159	412	475	1	0	0	4	5	10	0	2	76	88
Louisiana	41	26	4	11	334,636	1,056	1,094	1	0	1	3	5	26	9	27	121	183
North	12	9	0	3	45,437	385	403	0	0	0	1	1	3	0	2	38	43
South	15	6	3	6	161,169	475	553	1	0	0	2	3	16	8	19	70	113
Offshore	14	11	1	2	128,030	196	138	0	0	1	0	1	7	1	6	13	27
Michigan	11	4	0	7	22,517	111	143	0	0	0	6	6	4	0	0	47	51
Mississippi	12	4	0	8	80,382	102	122	0	0	0	5	5	7	0	0	39	46
Montana	6	2	0	4	32,730	86	96	0	0	0	2	2	2	0	0	28	30
Nebraska	13	5	0	8	82,165	227	262	1	0	0	2	3	13	0	0	110	123
New Mexico	44	20	14	10	197,552	571	505	3	0	0	7	10	24	1	5	62	92
Northwest	22	4	13	5	86,832	218	176	2	0	0	5	7	12	1	4	22	39
Southeast	22	16	1	5	110,720	353	329	1	0	0	2	3	12	0	1	40	53
New York	9	4	0	‡5	9,250	131	....	0	0	0	0	0	0	0	0	0	0
North Dakota	4	2	0	2	28,787	88	65	0	0	0	1	1	4	0	0	30	34
Ohio	15	7	6	§2	42,871	301	304	0	0	0	0	0	0	0	0	3	3
Oklahoma	138	80	3	¶55	459,767	1,927	2,488	1	1	1	13	16	30	7	5	177	219
Pennsylvania	1	0	1	0	7,720	307	*217	0	0	1	0	1	0	0	11	18	29
Texas	390	235	15	140	1,646,325	6,145	6,166	15	1	4	68	88	188	12	67	1,391	1,658
Southwest (1 & 4)	59	25	4	30	219,265	720	920	4	0	1	22	27	27	2	20	227	276
Gulf Coast (2 & 3)	34	15	3	16	208,555	715	772	0	0	2	12	14	14	6	34	197	251
East (5 & 6)	21	7	1	13	119,667	356	324	0	0	0	10	10	4	0	2	104	110
N. Central (7-B & 9)	124	62	3	59	325,541	2,210	2,144	6	0	0	16	22	97	0	5	609	711
West (7-C & 8)	127	107	2	18	654,460	1,757	1,674	4	0	1	6	11	43	0	5	231	279
Panhandle (10)	25	19	2	4	118,837	387	332	1	1	0	2	4	3	4	1	23	31
Utah	2	2	0	0	12,036	45	23	0	0	0	0	0	3	0	2	23	28
West Virginia	16	1	13	2	42,474	186	200	0	0	0	0	0	0	0	7	2	9
Wyoming	9	7	1	1	41,257	224	206	1	0	0	0	1	10	0	2	69	81
Miscellaneous	0	0	0	0	0	19	49	0	0	0	0	0	0	0	1	13	14
Total U. S.	**919**	495	65	359	3,746,404	15,160	16,106	25	2	7	151	**185**	394	29	145	2,934	3,502
Total previous week	962	511	69	382	4,073,896	.....	.....	19	2	13	197	231	369	27	138	2,783	3,317
Total Apr. 14, 1956	1,061	596	75	390	4,440,142	.....	.....	28	4	4	193	229	450	50	102	2,937	3,539
Cumulative 1957	15,160	8,040	1,141	5,979	62,740,786	.....	.....	...	....	....	....	....	....	....	....	....	....
Western Canada	60	38	2	20	300,014	789	690	2	0	0	12	14	19	0	16	181	216

Service wells included: ‡5, §1, ¶15. *Incl. N. Y. †Incl. Ga. 1 dry 4,995 ft.

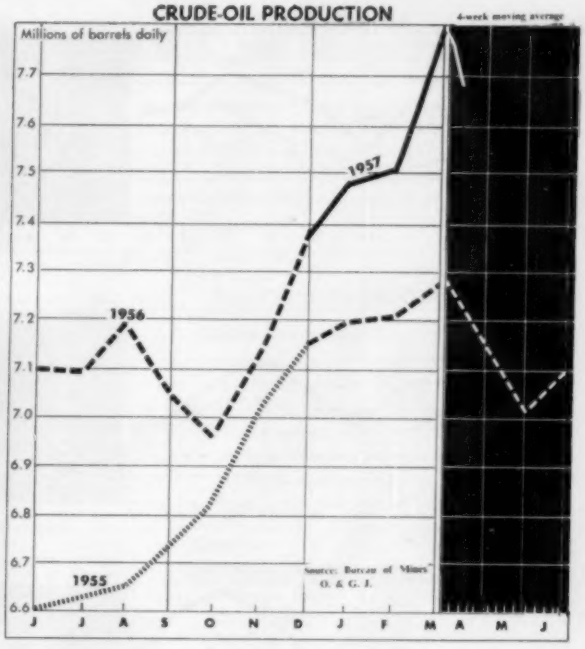
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



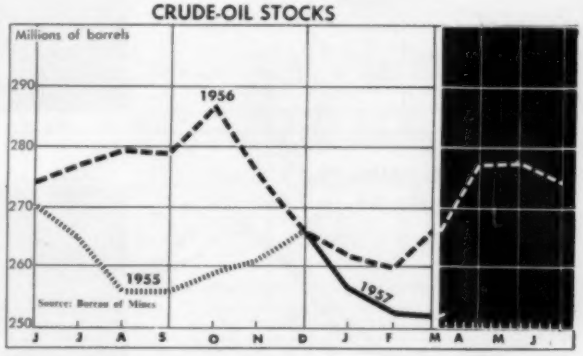
DAILY AVERAGE PRODUCTION FOR WEEK

	April 13, 1957			Apr. 6
	Crude oil	Lease condensate	Total	total
Alabama	11,700	.....	11,700	11,750
Arkansas	83,250	300	83,550	83,500
California	931,100	.....	931,100	937,200
Colorado	153,400	.....	153,400	158,750
Eastern	50,600	.....	50,600	50,200
Florida	1,225	.....	1,225	1,225
Illinois	226,500	.....	226,500	226,500
Indiana	31,900	.....	31,900	32,200
Kansas	†298,300	.....	†298,300	†291,700
Kentucky	47,400	.....	47,400	47,500
Louisiana	878,050	74,600	952,650	970,025
North	129,050	3,100	131,150	132,100
South	749,000	71,500	820,500	837,925
Michigan	27,900	.....	27,900	27,800
Mississippi	110,050	4,900	114,950	114,700
Montana	72,750	.....	72,750	70,500
Nebraska	38,650	.....	38,650	38,650
Nevada	100	.....	100	100
New Mexico	269,200	5,200	274,400	272,675
North Dakota	39,150	.....	39,150	40,700
Oklahoma	†602,800	.....	†602,800	†696,600
Texas	3,150,000	55,250	3,205,250	3,241,525
Dist. 1	56,000	475	56,475	56,750
Dist. 2	155,000	8,750	163,750	166,325
Dist. 3	444,000	26,300	470,300	474,575
Dist. 4	245,000	6,600	251,600	253,875
Dist. 5	42,000	400	42,400	42,975
Dist. 6	140,000	6,000	146,000	148,000
East Texas field	210,500	.....	210,500	215,775
Dist. 7-B	168,000	75	168,075	169,500
Dist. 7-C	171,000	4,225	171,000	176,650
Dist. 8	1,195,000	1,400	1,196,400	1,213,275
Dist. 9	214,000	700	214,700	215,275
Dist. 10	109,500	325	109,825	108,550
Utah	14,600	.....	14,600	14,000
Wyoming	295,250	.....	295,250	303,500
Others	‡100	.....	‡100	‡100
Total U. S.	7,333,975	140,250	**7,474,225**	7,631,400
Change from previous week, down			**157,175**	
Canada	†477,600	.....	†477,600	†498,800

Total U. S. production, January 1-April 13 ..... 781,380,850 bbl.
Same period last year (crude plus cond.) ..... *750,952,508 bbl.

*Includes 13,553,030 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS



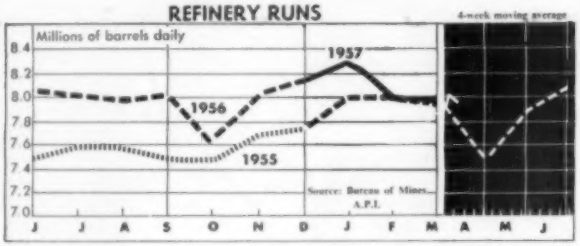
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

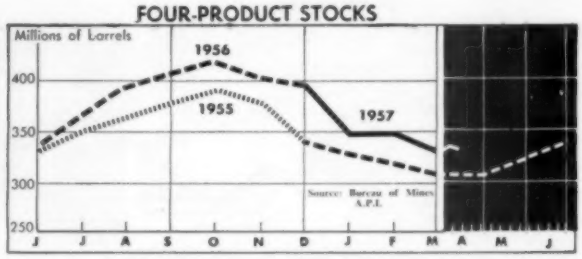
	4-6-57	3-30-57	4-7-56
Pennsylvania Grade	2,609	2,503	2,627
Other Appalachian	1,816	1,963	2,225
Illinois, Indiana, Michigan	9,334	9,580	9,940
Nebraska, North Dakota	2,002	2,029	1,792
Kansas	9,013	9,000	7,810
Oklahoma	22,636	21,722	23,779
Arkansas	2,491	2,467	2,915
Louisiana	18,283	17,806	16,446
North	2,827	2,872	2,635
South	15,456	14,934	13,811
Mississippi	2,284	2,103	3,060
New Mexico	7,002	6,841	7,632
Texas	113,702	115,329	123,648
East Texas proper	10,869	10,719	9,205
West Texas	52,587	53,902	61,483
Texas Gulf	21,736	21,938	21,792
Other Texas	28,510	28,770	31,168
Wyoming	16,660	16,615	16,619
Other Rocky Mountain	5,919	5,926	5,771
California	25,622	26,101	27,921
Foreign	†12,952	12,324	11,638
Total	252,325	252,309	263,823

*Bureau of Mines. †Includes 3,754,000 bbl. in California.

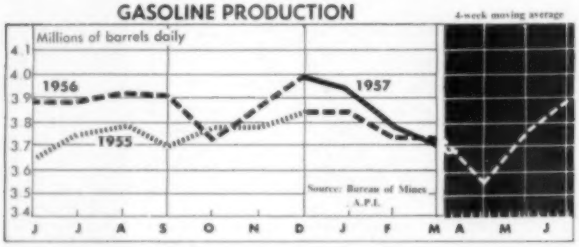
REFINERY RUNS



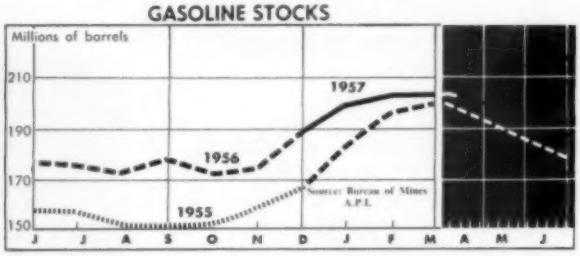
FOUR-PRODUCT STOCKS



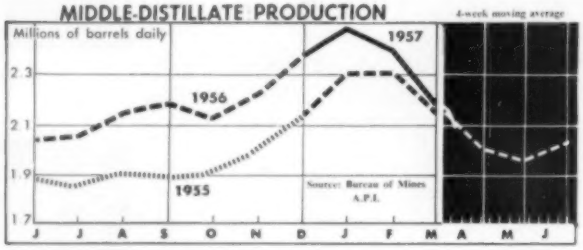
GASOLINE PRODUCTION



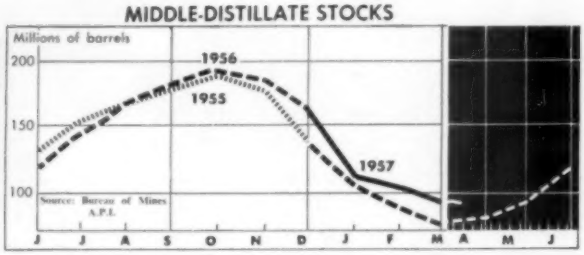
GASOLINE STOCKS



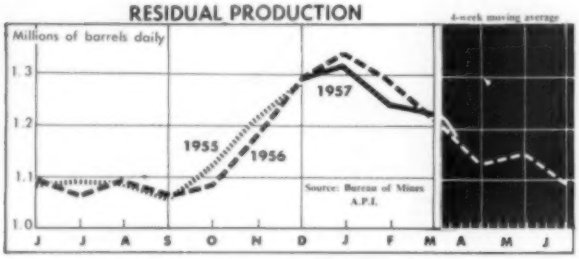
MIDDLE-DISTILLATE PRODUCTION



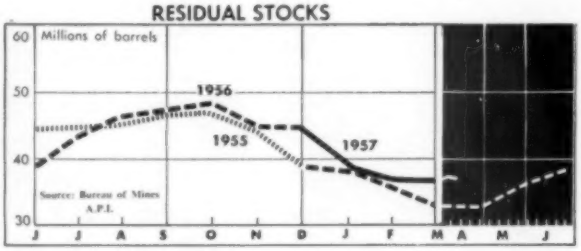
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, APRIL 12, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,226	512.6	41.4	342.1	210.0	43,433	8,097	22,612	8,248	1,027	417.0	30.2	285.3	196.1
Appalachian:														
District 1	97	39.7	5.9	19.0	6.6	5,259	454	1,788	402	94	36.5	4.3	21.5	6.3
District 2	106	52.3	7.1	15.9	13.6	2,929	388	614	331	100	48.7	6.4	15.7	14.0
Ind., Ill., Ky.	1,343	686.0	63.0	275.8	160.1	37,772	3,443	11,379	4,743	1,333	674.4	77.0	257.8	172.0
Minn., Wis., Dak.	92	43.4	5.7	29.6	8.0	6,973	282	3,235	373	80	37.3	3.7	20.9	5.8
Okla., Kans., Mo.	689	368.4	19.6	142.4	32.6	21,039	928	7,118	845	604	307.5	12.4	141.6	29.5
Inland Texas	235	181.9	7.2	46.3	18.7	8,169	267	1,424	1,792	246	185.2	9.2	46.3	28.3
Texas Gulf Coast	1,948	926.4	80.6	481.4	221.4	26,882	2,772	8,357	4,794	1,958	925.0	93.8	523.8	244.8
La. Gulf Coast	647	281.3	62.4	165.6	45.7	10,663	1,824	4,954	1,312	678	337.1	52.1	161.7	47.8
N. La. and Ark.	87	42.7	4.7	23.7	6.3	4,872	800	1,503	182	60	20.4	1.9	17.8	2.5
Rocky Mountain:														
New Mexico	28	13.3	0.6	5.0	3.4	400	9	78	69	24	12.9	0.3	4.3	3.0
Other Rocky Mt.	227	113.4	2.4	57.3	27.6	8,032	245	2,450	1,012	227	103.2	2.3	55.5	32.0
California	1,174	498.9	4.3	174.6	364.3	26,481	314	8,644	12,655	1,056	452.1	5.6	160.7	347.6
April 12, 1957	7,899	3,760.3	304.9	1,778.7	1,118.3	202,904	19,823	74,156	36,758	7,487	3,557.3	299.2	1,712.9	1,129.7
April 5, 1957	7,856	3,669.0	268.6	1,804.9	1,178.3	203,310	19,729	75,295	37,594	.....	.....	.....	.....	.....
April 13, 1956	1,551	3,631.0	295.3	1,738.6	1,168.3	195,059	17,607	60,832	32,788	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.75-12.25
Premium (96 octane)	13.50-14.00
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	13.00-13.50
Premium (98 octane)	13.25-13.75
California (rack):	
Regular (86 octane)	13.1
Premium (93 octane)	14.1
Premium (96 octane)	15.1
Caribbean area (cargoes):	
Regular (87 octane)	11.00
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.00-10.375
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	9.00-9.375
Gulf Coast (cargoes):	
Kerosine 41-43	10.50-11.00
Distillate No. 2	10.00-10.50
New York Harbor (barges):	
Kerosine 41-43	12.25
Distillate No. 2	11.65
Diesel fuel, 48-52 d.i.	11.95
Caribbean area (cargoes):	
Distillate No. 2	10.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max 1% S)	$2.25-2.35
Gulf Coast (cargoes):	
Bunker C fuel	$2.75-3.00
New York Harbor (barges):	
Bunker C fuel	$3.30-3.40
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.75-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.89
16-16.9	2.74	....	....	....	1.94
17-17.9	2.78	....	....	....	1.99
18-18.9	2.82	....	....	....	2.04
19-19.9	2.85	....	....	....	2.09
20-20.9	2.89	$2.75	....	$2.62	2.14
21-21.9	2.93	2.77	....	2.64	2.19
22-22.9	2.97	2.79	....	2.66	2.24
23-23.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low Cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, January 16, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.88
Middle District	4.70
Southwest Pennsylvania	4.41
West Virginia	4.23
Buckeye Grade	4.23
Zanesville Grade	3.27
Illinois Basin	**3.15**
Canada:	
Leduc-Woodbend	2.78
Redwater (Alta.)	2.67
Smiley (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 40°-40.9°, Puerto La Cruz	3.37
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Iraq, 36.0°-36.9°, Tripoli, Banias	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., dirty (USMC+15%)	$3.28
★ N.W.I.-U.S.N.H., dirty (USMC flat)	2.70
★ Gulf-U.K., dirty (Scale+45%) (55s. 8d.)	7.79
★ N.W.I.-U.K., dirty (Scale+40%) (45s. 6d.)	6.37
★ P.G.-U.S.N.H., dirty (USMC+5%)	13.34

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ROYALTIES

VICINITY GOFF-LEEPER: #1 Sasser, Northern McClain County, Oklahoma. 20 acres undivided minerals under 60 acres Section 20 and 29, 7N-2W. Make offer. Lynn Elrod, 1114 Brady, Wichita, Kansas.

OFFERING CHOICE ROYALTIES. You can now make very small investments on income Royalties or those ahead of drilling. A. S. Berry, 520 Wright Bldg., Tulsa, Okla.

LEASE AND DRILLING BLOCKS

80 ACRES, five possible pays. Offset two original wells with oil in Dutcher and Bergen. 1/8—$900.00, 1/4—1600.00, 1/2—$3200.00, all for $6000.00. L. Price, Coweta, Okla.

NOW BEING LEASED Forrest City Basin in Iowa. Can I assist you? A. J. Barrett, P. O. Box 122, Siloam Springs, Arkansas.

320 ACRES offset to well that made 400 feet free oil in drillstem test between 1600 and 1700, oil 40 gravity. This acreage donated for well. Box K-123, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL, GAS AND MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 215 Littlefield Building, Austin 15, Texas.

OIL LEASES IN BOOMING

4-Corners Area. November Indian Lease sale brought 30 Million Dollars. Some leases sold for $3,200 per acre. Wells estimated up to 1500 barrels of oil per day. Oil Leases from $2.25 an acre. Fortunes being made. Write for free information now. **ATLAS OIL SURVEY, Dept. OJ-5, Colorado Bldg., Denver 2, Colo.**

PRODUCTION FOR SALE

FOR SALE: White Co., Ill. 1 Producing well. Gross income about $500.00 monthly. 2nd well drilled and cased. Equipment value about $11,500.00. Quick sale $12,800.00. Address 500 S. St. James, Evansville, Indiana. Phone GReenleaf 7-0092.

PRODUCTION WANTED

WANTED FOR CASH—Depleted and Marginal Wells for Salvage. Frank J. Black, P. O. Box 150, Phone 107, McPherson, Kansas.

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

PRODUCING oil, gas properties, also royalties wanted. Any size, any amount. Complete details in first letter. Box 231, Scarsdale, N. Y.

WANTED: Oil or gas production, any size, prefer, Okla., N. M., Tex., Colo. or Kan. B. Thurston, 1427 Princeton NE, Albuquerque, N. M.

HAVE DEAL FOR: 20 to 500 barrels settled production, also have Kansas block of 500 acres to farm out, will hold 1/8 override and furnish $1,000.00 dry hole money, can operate same. Lewis Short Explorations, Burrton, Kansas.

FOR SALE EQUIPMENT

N-3 BREWSTER Drawworks complete with 1 GZBU Waukesha 20 months old—excellent condition. Price $13,750.00. Contact IVERSON SUPPLY COMPANY, Odessa, Texas. Phone FEderal 7-2349.

FOR SALE: Bell and Gossett Heat Exchanger, Type OCZ-181 E Straight Tube. Shell 16" x 12' long, capacity, 606 GPM with 50' head at 125# W.P. The tube bundle is new and contains 345—5/8" OD x .035" x 147 5/8" long copper tubes. Located at Centralia, Illinois. Contact Shell Oil Company, Mayo Building, Tulsa, Oklahoma, or Petroleum Building, Centralia, Illinois.

1100 FT. NEW 10¾" OD x ¼" WALL LINE PIPE—
—plain end—structural grade.
CENTRAL PIPE & SUPPLY CO.
Box 1466, Phone SH 4-7404
Lubbock, Texas.

FOR SALE EQUIPMENT

3 ELECTRIC Generating Sets, each consists of E. M. Company 175 KW, 219 KVA, 900 RPM, 3 phase, 60 cycle, 480/830/960/1160 volt generator, direct coupled to Waukesha 6-L ROU engine, all skid mounted. Good condition. Located at Lance Creek, Wyoming. The Carter Oil Company. Contact Mr. J. L. Wible, Box 901, Billings, Montana.

USED EQUIPMENT—FOR SALE

127' LEE C. MOORE MAST—Series #127—5 Sheave Crown, Bolt Type with 4' and 3' Substructures. In excellent condition.
UNIT 10 DRAW WORKS with Air, Series 81, Compound and Drilling Line.
5x10 MUD PUMP with Model U9 International Motor—also equipped with 3" Bronze Liners for Salt Water Disposal Pump.

Call or Write:
THE OKLAHOMA COMPANY
412 Hales Building Phone REgent 6-7526
Oklahoma City, Oklahoma

BRILL BUYS—THE BEST!

NEAR LONGVIEW, TEXAS

FORMER LACY REFINERY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
1—5' x 96' tower, 40 tray, 135# WP.
1—2' x 50' tower, 24 trays.
1—Ethyl lead plant.
2—Upshot heaters, 10 mil. BTU/hr.
8—Welded storage tanks, 5,000, 2,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 13, 6 x 4 x 12, 6 x 3 x 8.

IN STOCK

VESSELS

2—12' x 45' Butane Tanks, 125#
2—12' x 45' Storage Tanks, 25#
1—14' x 21' Clay Tower, 125#
1—8' x 75' Tower, 20 Trays, 25#
1—18" x 32' Tower, 15 Trays, 160#
2—8½' x 25' Tanks 50#
5—Packed Towers 14" x 40', 18" x 23', 160# Wyatt 1950.
1—Poly Reactor, 550#, 24" x 28'.

HOT-OIL PUMPS

3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—400' Hd.
BJ hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

HEAT EXCHANGERS

4—Kellogg Adm. Fltg. Hd. 2200, 1300 Sq. Ft., 315#
4—Kellogg Stel Fltg. Hed. 800, 650, 500 Sq. Ft.
18—OR Fin Tubes, 73 Sq. Ft.
6—Brown Fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome.
5—Steel 1,000, 900, 800, 600, 500 Sq Ft.
6—Adm. 785, 742, 425 Sq. Ft.
30—304 SS shell & tube condensers 100-1000 Sq. Ft.

COMPRESSORS

1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 lbs.
385 CFM 160 lbs.

MISCELLANEOUS

6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 28.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
Lab Petro-Chem furnace 50,000 BTU/hr.
Tremendous selection stainless steel and steel valves 1½"-6".
Goulds 16" pump, 10,500 gpm, 135' hd.

PARTIAL LIST ONLY

WIRE! PHONE! WRITE!
FOR DETAILED CIRCULAR

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, JA 6-1351
OR
2401 Third Ave., New York 51, N. Y., CYpress 2-3703

FOR SALE EQUIPMENT

FOR SALE—Used—10' x 40' 24,000 gal. horizontal steel riveted and welded gasolene storage tanks, three at Tallant, Oklahoma, $1,000.00 each, seven at Wichita gasolene plant, $850.00 each. Cities Service Oil—Patridge—Bartlesville.

4000' RIG FOR SALE. SM 4000, single drum, truck mounted Franks drilling rig; 60' Franks 4 legged derrick; D-175 Emsco (6¾-12) pump, powered by GMC 6-110A Diesel; drawworks powered by 671 GMC diesel, torque converter; dog house-tool house, float mounted; air conditioned aluminum "Travelite" trailer house, 3½" API modified drill pipe, 3000'; hand tools, subs, 2 light plants, 2 water pumps, 2 5⅜" drill collars. Complete inventory on request. Write Petro-Tex Oil Corp., 900 N.E. Military Dr., San Antonio, Texas. TA 4-2377.

FOR SALE EQUIPMENT

COMPLETE PIPE-THREADING shop. Two Landis machines 13⅜" and 7", with building, fully equipped. Bargain. Phone Diamond 3-9563. Lundquist, Box 1215, Tulsa, Oklahoma.

PRICED TO SELL. Hydraulic pipe pulling unit, two speed 6' jacks, spiders, slips, arch bars, sill, breakout tongs, 4 cylinder displacement pump etc. All on '47 2-Ton Dodge Truck. All in good shape and ready to work. Phone S.H. 6-4016, J. E. Bedingfield, Box 563, Artesia, N. M.

LATE MODEL 72 Semi-trailer Speedstar complete with Tools, truck, and trailers, also, late Model 71 Truck mounted Speedstar, 24L Bucyrus, 45 Star and others. Star Drilling Supply Company, Chanute, Kansas. Distributors for Star Drill Keystone Company.

FOR SALE EQUIPMENT

SMALL FAILING rotary or coring drill. Truck-mounted, with pump, some equipment. Reasonable. Contact: Bob's Carter Service, 1325 First Avenue North (Phone 9-0848) Billings, Montana.

FOR SALE OR TRADE, complete steam rig less drill pipe near Beaumont, Texas. Will take royalty or production payment. Box K-130, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE at below our cost. BRAND NEW approximately 1360 feet of 2⅞ J-55 tubing joints. Lengths range from 23 to 25 feet. Price $2 a foot. Call Ralph Varel, FL 1-6487, Varel Mfg. Co., 9230 Denton Dr., Dallas.

32 DRILL COLLARS, 20 ft. OD, 5", ID 2 in., 41-40 heat-treated steel, BRAND NEW. $300 each. Ask for Ralph Varel. FL 1-6487, Varel Mfg. Co., 9230 Denton Dr., Dallas.

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

C-34 WALKER-NEER Spudder, with or without 5-7 tools. A-1 condition. Fully equipped. Located at Drumright, Oklahoma. Box 788 or phone 20, Drumright.

GAS METERS FOR SALE: Foxboro and Westcott Orifice Meters. Large Stock of Late Types and in Good Condition. George Milner, Box 124, Okmulgee, Okla.

LIQUIDATION—Drumright, Okla.
TIDEWATER OIL COMPANY
Modern 15,000 Bbl./Day Refinery

Presently being dismantled — Immediate removal and shipment — exceptional prices

HOUDRIFLOW CATALYTIC CRACKING UNIT, 8800 BBL./DAY (NEW 1952)

TOWERS

8'x5'x85'6" 25 Trays 250 PSI
8'x34'6"x½" 10 Trays
6'x30'x½" 9 Trays
4'6"x30'5"x⅜" 14 Trays
4'x49'6"x⅜" 24 Trays 330 PSI
3'x69'6"x½" Raschig Rings 200 PSI
3'x23'6"x1¼" Catalyst 600 PSI (2)

ETHYL BLENDING PLANT 8500 GAL. COMPLETE SKIMMING POND

VESSELS

6'x40' SOAKER, 500 PSI @ 850° F.
20'x28'4" AGITATOR, cone bottom
10,000 bbl. HORTONSPHERE
6500 gal. PROPANE TANK

50,000#/HR. COCHRANE WATER TREATING AND DEAERATING PLANT

HEAT EXCHANGERS

Sq. Ft.	Type	Tubes	Shell
1080	Reflux	Adm. 125#	Steel 250
993	Reboiler	Steel 600#	" 600
970	"	" 125#	" 250
750	"	" —	—
331	16-138	Adm. 250#	Steel 250
331	16-138	Adm. 125#	" 250
Brown	Fintube	Steel 600#	(11)

110,000 GAL. FOAMITE SYSTEM—COMPLETE

VACUUM CRUDE DISTILLATION UNIT, 15,000 BBL./DAY (NEW 1953)

FURNACE TUBES

500—New Croloy #5, 3" to 6⅝" OD 15' to 32' long
500—4", 4-6% Chrome, headers
200—4½", 4-6% Chrome, headers
200—5", 4-6% Chrome, headers

UPSHOT HEATER COIL TYPE "D" 3" PIPE 600 PSI—417 SQ. FT. GAS FIRED

PUMPS

HOT OIL 334 GPM, 1,000 PSI (2)
FIRE 2500 GPM at 426' head
CENTRIFUGAL from 60 to 1500 gal. from 40' to 655' head
STEAM—Hot Oil—Simplex—Duplex
PROPORTIONING—1 to 5 HP

2-28 SPOT CAR LOADING RACKS, CAPABLE 10 PRODUCTS EACH SPOT

OTHER ITEMS

1000 M CFD COOPER GAS COMPRESSOR
HEAT EXCHANGERS—196-3100 sq. ft. (25)
NEW STEEL STACKS—240'
53—STORAGE TANKS—1,000-100,000 bbl.
40—STORAGE TANKS—1,000-27,000 gal.
10 Ton OVERHEAD TRAVELING CRANE
PIPE—VALVES & FITTINGS—
MACHINE TOOLS—WELDERS—
HYDRAULIC JACKS—HAND TOOLS—
CHEMICALS, ETC.

TELEMATIC 48 TANK GAUGING SYSTEM

Your inspection invited—representatives on premises
Write - Wire - Phone for Complete Information, Catalog

HEAT AND POWER CO., INC.

NEW YORK OFFICE—60 East 42 St., New York 17, N. Y., Murray Hill 7-5280
TULSA OFFICE—310 Thompson Bldg., Tulsa 3, Okla., Diamond 3-4890
DRUMRIGHT OFFICE—P. O. Box 587, Drumright, Okla., Phone 569

FOR SALE

One good used skid mounted Gardner-Denver Compressor, Mod. 425 DD rated 1000 MCF per day at 300# suction—1000# discharge with 145 GK Waukesha. Contact Drew Cornell, Inc., Box 1267, Lafayette, Louisiana.

OR WILL TRADE FOR FOLLOWING:

WANTED

One good used skid mounted Compressor—rating 5,000 MCF per day at 300# suction and 1000# discharge. Contact

DREW CORNELL, INC.
BOX 1267,
LAFAYETTE, LOUISIANA

1—BS&B 40 CAR— Double Track— Safwalk Loading Rack

complete, slightly used, dismantled, excellent buy, cost today $9500.00, priced to sell, $1500.00.

A. A. GILBERT PIPE & SUPPLY COMPANY
P. O. BOX 988 PHONE LD-97
SHREVEPORT, LOUISIANA

CLARK BROTHERS—Model HMA6 angle unit complete with Young cooler and all fittings. Six power cylinders 8¼ x 8¼, 265 hp at 600 rpm. Gas cylinders, two 14½ and one 10½. Capacity 1,500,000 CFD at 0# suction. Practically new condition immediately available and priced at a bargain.

COOPER-BESSEMER—Model GMXA angle compressor complete with Young cooler and all fittings. Four power cylinders 9¾ x 10½. 250 hp at 400 rpm. Two gas cylinders, one 20" and one 10¾". Capacity 1,500,000 CFD at 0# suction. This unit used very little and practically new.

CARSON MACHINE AND SUPPLY COMPANY
Oklahoma City, Okla. Great Bend, Kans.
Tulsa, Okla. Garden City, Kans.

FOR SALE EQUIPMENT

LIQUIDATION 11,000 BBL. REFINERY

D-X SUNRAY OIL CO., ALLEN, OKLA.

We are now liquidating this modern refinery and can offer equipment at a fraction of its cost.

INCLUDED ARE: 6 Heaters with Chrome Tubes, Welded Towers from 2' to 8' with Operating Pressures up to 475 psi., Reboilers, Accumulators, Heat Exchangers, Hot Oil Pumps, Centrifugal and Steam Pumps, Boilers, Gas and Diesel Generator Sets, New Chrome Heater Tubes, Pipe, Valves, etc.

Your Inspection Is Invited. Write for Catalogue.

HEAT & POWER CO. Inc., 60 E. 42 St., New York 17, N. Y.
310 Thompson Bldg., Tulsa 3, Okla.

OB-12 BREWSTER Rotary Table. Recently overhauled. Excellent Condition. Price $1250.00. NAPCO Drilling & Well Servicing Co. P. O. Box 1032, Duncan, Oklahoma. Phone 938 or 2917.

FOR SALE: Bucyrus Erie 48L machine. Equipped with base, enclosure, ready to go to work, used as top to bottom hole drilling unit. Price $17,500. Mai Drilling Co., Russell, Kansas.

FOR LEASE OR SALE—Truck mounted rotary drills, water tanks, air compressors. Telephone TAylor 7-3216, Dallas, Texas, Walters Drilling Company.

FOR SALE: 1—50 H.P. 72" Stroke Twin Crank Parkersburg Pumping Unit, with 60 H.P. 4-Cylinder Waukesha Engine. 1—50 H.P. 74" Stroke Twin Crank O.C.S. Pumping Unit with 6MCAU Waukesha Engine. 1—#TC-33-22E 29 H.P. 54" Stroke Twin Crank Lufkin Pumping Unit with VIKU Waukesha Engine. 2—D-80 16.8 H.P. 48" Stroke Twin Crank American Pumping Units with ZC-346 Fairbanks-Morse engines. Overton Supply Co., Overton, Texas.

STEEL PIPE & TUBING

• CHROME MOLY • CARBON MOLY
• MONEL • CARBON STEEL • STAINLESS

Widest Range of Sizes & Specs in the U. S.

WRITE FOR STOCK LIST

MIDCONTINENT TUBE SERVICE, INC.
2308 Oakton St., Evanston, Ill. DA 8-4030

FOR SALE

Complete rotary drilling rig. U-15 drawworks powered by 3—NKU Waukesha engines. Late style 133' Oilwell derrick with 7' 8" Oilwell substructure. 7½" x 14" Oilwell 214-P mud pump. Double Shaffer blowout preventer. Drill pipe and drill collars are also available with this rig making it ready to move on location.

Also listed for sale is a clean D7 Caterpillar tractor, series 4T with an inside hydraulic 8' blade and a D7N Hyster worm driven winch. Serial #19131.

For further information concerning this equipment call

HENSON DRILLING COMPANY,
OR 2-4112, or write to Box 2192,
ABILENE, TEXAS.

EQUIPMENT WANTED

11½" or 12" bore x 12" stroke cylinder complete with piston for model SVG-10 Ingersoll-Rand angle type compressor.

CARSON MACHINE AND SUPPLY COMPANY
Oklahoma City, Okla. Great Bend, Kans.
Tulsa, Okla. Garden City, Kans.

FOR SALE EQUIPMENT

FOR SALE: Three Type 80 Cooper gas compressors complete with building. Alfred B. Kern, 305 Kennedy Building, Tulsa, Oklahoma.

HELP WANTED

GULF OIL CORPORATION
— ENGINEERS —

PETROLEUM
GAS
DRILLING
RESERVOIR
MECHANICAL
PIPE LINE

Subsidiary operating in Venezuela has opportunities for engineers with/without experience. Salary commensurate with experience.

P. O. BOX #35
Bowling Green Station, New York 4, New York

SURFACE GEOLOGISTS

(Ages 24 - 38)

Current employment opportunities with a major integrated United States oil company in South America. Openings now exist in an expanding Geological organization at levels requiring from 3 to 8 years of field party experience. Salary, including bonus, from $14,000 to $17,750. Liberal employee benefits and home vacations with travel expenses. Interested experienced Surface Geologists with B.S., M.S., or Ph.D. degrees in Geology are invited to send complete resumes to the address given below. Interviews will be arranged for qualified candidates. All replies strictly confidential.

P. O. BOX 480

NEW YORK 19, NEW YORK

DEPT. A-21

FOR SALE EQUIPMENT

FOR SALE: 600 tons Carnegie MP-115 42 ft. & Larssen Section II 30 ft. and 40 ft. lengths steel sheet piling located New Orleans and Tampa. Seaboard Steel Company, Tel. RIngling 7-0461, Sarasota, Florida.

FOR SALE—Cardwell Spudder, RL502, complete with tools, equipment necessary for efficient operation. Price, inventory on request. K & A Drilling Co., Phone 448R, Box 497, Ellinwood, Kansas.

HELP WANTED

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs. $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

Experienced Asphalt Sales Engineer

Must be thoroughly familiar with pricing and specifications and have wide acquaintance. To be located in Mid-Continent area. Good opportunity for right man. State age, experience and starting salary expected. All replies will be kept strictly confidential.

Box K-129,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

PETROLEUM ENGINEERS

for Reservoir & Production engineering in varied types active fields in COLOMBIA, SOUTH AMERICA. Excellent salary, allowances, opportunity obtain additional experience & advancement. Minimum 2 years exp.

Forward Personal data, college transcript, to:

C. L. LAUE
Colombian Petroleum Co.
375 Lexington Ave., New York 17, N. Y.

SOUTH AMERICA

• Career employment with Major American Oil Companies • Salaries Open • Cost of Living Allowance • Monthly Bonus.

NO U. S. INCOME TAX
OUR FEE AND TRANSPORTATION PAID

Maximum Age to 40

- ENGINEERS, ALL TYPES—Degree required. Exp. or inexperienced.
- GEOLOGIST, Deg.—Age to 32. Single.
- TOOLPUSHERS, 3 to 5 yrs. experience.
- MECHANIC GAS, 5 yrs. experience.
- MECHANIC DIESEL, 4 yrs. experience.
- FOREMAN CONNECTION, 3 yrs. experience.
- FOREMAN ELECTRICAL, 3 yrs. experience.
- SUPERVISOR, OIL HANDLING, 3 yrs. Must have field experience.
- MUD TECHNICIAN, 1 yr. experience. Age to 32.
- TEACHER-PRINCIPAL, Male. Must have B.S. in education.
- STENOGRAPHER, Male. 1 year experience. Age to 32. Must be single.

All information confidential.

Send complete resume to:
OVERSEAS EMPLOYMENT SECTION

CHAS. J. LOVELESS
PERSONNEL SERVICE
616 S. Main • Tulsa, Okla. • GI 7-3193

HELP WANTED

GEOLOGIST: Have opening for Geologist with experience in North and East Texas, Arkansas, Kansas and Louisiana to be located in Oklahoma City. Reply ASHLAND OIL & REFINING COMPANY, Attn.: Division Manager, 720 N.W. 50th, Box 9695, Oklahoma City, Oklahoma. Replies Confidential.

HELP WANTED

PROCESS ENGINEER. Modern, growing plant in Gulf South has opening for Process Engineer experienced in catalytic reforming, petrochemicals and economic studies. Furnish record of education, experience, and salary requirements. Write Box J-963, The Oil and Gas Journal, Tulsa, Oklahoma.

OPPORTUNITIES IN PERU, SOUTH AMERICA
with
INTERNATIONAL PETROLEUM COMPANY, LTD.

Having recently acquired additional production in this area, we now have attractive positions available for men in the following categories:

Petroleum Engineers Reservoir Engineers Drilling Engineers Equipment Engineers Gas Plant Engineers	College degree—should have minimum of two years experience in specific field and total of four years in petroleum industry.
Drilling Foremen Production Foremen	Extensive supervisory experience with minimum of 10 years in petroleum.
Geologists Paleontologists	College degree, plus minimum of four years experience.
Accountants	College degree, plus minimum four years experience in

Attractive salaries and bonuses, liberal benefit plans and vacations, paid transportation, family housing available. Ideal climate. Age to 45.

WRITE—giving age, education, marital status and complete details of experience. Personal interviews will be arranged with qualified candidates.

Box—308-E, Radio City Station, New York 19, New York.

PALEONTOLOGISTS
(Ages 30 - 38)

Current employment opportunities with a major integrated United States oil company in South America. An opening now exists in an expanding Geological organization for an experienced Senior Paleontologist with proven supervisory ability and know-how to run commercial laboratory. Salary, including bonus, $18,500. Liberal employee benefits and home vacations with travel expenses. Interested experienced Paleontologists with B.S., M.S., or Ph.D. degrees are invited to send complete resumes to the address given below. Interviews will be arranged for qualified candidates. Replies strictly confidential.

P. O. BOX 480
DEPT. A-21
NEW YORK 19, NEW YORK

ENGINEERS—Chemical, Mechanical, Petroleum or Gas Engineering graduates. Major Oil Company will interview applicants for openings in natural gas department. Their area of operations consists of Mid-Continent, Louisiana and Gulf Coast. Salary to suit previous experience. Our employees are aware of this ad. Box K-101, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOGRAPH TECHNICIAN fully conversant with recent developments and interpretation, 8-10 years' field practice, wanted to assume responsibilities of supervision and interpretation at headquarters of French oil company in Algiers. Furnish full information on education, experience. Box K-116, The Oil and Gas Journal, Tulsa, Oklahoma.

Refinery Technologist

If you are a chemical engineer with 3 to 5 years experience in refinery process engineering or operation and economic analysis and have an interest in consulting and technical service type work, you should investigate this unique opportunity to capitalize on your background and to participate in the growth of an expanding technical activity of a well-known company allied to the refining industry. This position offers a wide variety of assignments, industry-wide contacts with refining and process companies, for using initiative and originality to increase responsibility. A midwest suburban location offers ideal professional environment. Send resume of qualifications to

Box K-117,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

LANDMAN

Independent Oil Company has opening for experienced Landman. Must know all phases of landwork and have ability to assemble deals and make trade. Geological background preferred. Must have experience and knowledge of Mid-Continent area. Age limit 40. Salary will be commensurate with ability and experience. Reply giving past employment, education, and qualifications. All replies confidential. Reply

BOX K-108, THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

GEOPHYSICISTS

(Ages 26 - 36)

Current employment opportunities with a major integrated United States oil company in South America. We now have openings in our expanding Geological organization for Seismic Interpreters with from 4 to 8 years experience. Salary, depending upon experience and including bonus, from $15,750 to $17,750. Liberal employee benefits and home vacations with travel expenses. Interested experienced Geophysicists with B.S., M.S., or Ph.D. degrees are invited to send complete resumes to the address given below. Interviews will be arranged for qualified candidates. All replies strictly confidential.

P. O. BOX 480

DEPT. A-21

NEW YORK 19, NEW YORK

PETROLEUM ENGINEER—Large and aggressive oil company has opening for petroleum engineer with three to four years drilling and production experience for Central Kansas District Office. Good opportunity for advancement with company having excellent employee benefits and rapid expanding operations. Furnish resume of experience and education. All replies confidential. Apply Box K-142, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF ACCOUNTANT

Well qualified chief accountant with oil accounting, I.B.M. and tax experience needed by active independent oil company in Houston. C.P.A. qualifications desirable, good salary, opportunity for advancement. Replies treated confidentially.

Box K-138, The Oil and Gas Journal, Tulsa, Oklahoma.

Operations Engineer

Independent oil company has opening for petroleum engineer with four to seven years experience both technical and administrative for responsible position in planning and control. Knowledge of operating procedures, some valuation work and practical oil and gas law would be desirable. Excellent growth opportunities. Please furnish complete details on qualifications, including starting salary required.

Box J-987,

The Oil and Gas Journal,
Tulsa, Oklahoma.

PETROLEUM ENGINEER with Master's Degree, or Doctor's in Chemical, Mechanical, or Petroleum Engineering for research and teaching in Petroleum Production Engineering at rapidly growing southwestern institution. Rank and salary open, twelve months employment possible, consulting work encouraged and available in immediate area. Applications will be kept confidential. Box J-902, The Oil and Gas Journal, Tulsa, Oklahoma.

ESTABLISHED, well-regarded oilfield equipment manufacturer desire the services of Petroleum or Mechanical Engineer to head product development program. Must have talent for design and ability to conceive and develop new ideas. Major oil company experience desirable. Good opportunity for right man. Salary open. Please give full information. Replies held in strictest confidence. Box K-131, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPELINE ECONOMIC STUDIES

MAJOR CONSULTING ENGINEERING COMPANY

requires

Management Type Man for Developing Economic and Feasibility Reports on Pipeline Systems.

Address:

Box K-118,

The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

SALES ENGINEER OR PETROLEUM ENGINEER

interested in sales in South America. Production, gas compression, waterflood, etc. or related experience desirable. Knowledge Spanish desirable but not necessary.

Box K-121, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGICAL ENGINEER: 10 years diversified experience in Production. Exploration, Drilling, and Land Operations in Mid-Continent Area. Desire affiliation with aggressive Producer, domestic or foreign. Box K-103, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Desires connection with company or independent, where use can be made of thorough knowledge of Mississippi and surrounding areas acquired through eight years of major company experience. Box K-126, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING SUPERINTENDENT with administrative experience. Employed 20 years in Mexico and South America. Capable of assuming entire responsibility of drilling operations. Desires foreign employment. Box K-106, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—experienced Kansas, Okla., Colo. geology, leasing, deals, drilling, seeks connection independent group desiring representative. Data currently maintained. Box K-120, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: Age 37, twelve years varied engineering, geological, drilling and production and supervisory major company experience. Desires responsible position in some phase of oil industry. Presently employed. Box K-135, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPT.-Drilling Engr. for large Drilling firm, 11 years prior major oil company experience desires affiliation with aggressive Independent. Registered Petroleum Engineer. West Texas, West Coast or Rocky Mt. area preferred. Box K-136, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, 20 years experience, now employed as contract supervisor desires connection with oil company. Majority of experience in West Texas and Rocky Mountains. College degree, married. Consider foreign assignment. Box K-140, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM ENGINEER: 36—married, 10 years experience with a major and an independent in drilling, completion, workover, production, administration, valuation and secondary recovery in central, southern and panhandle area of Oklahoma. Box K-139, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Desires affiliation with aggressive independent or small company offering opportunity for financial improvement and for the experience. B.S. degree, 10 years diversified exploration experience in Texas, Oklahoma and Louisiana. Currently employed. Age 34, married. Reply P. O. Box 2075, Dallas, Texas.

DISTRICT GEOLOGIST: Successful oil-finding record, 33, M.S., 9 years varied surface, subsurface, geophysical and development experience in Western United States and Gulf Coast. Employed by Major. Desires responsible oil-finding position with Independent. Box K-141, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER: Five years experience with major oil company in gasoline plant processing, design, operation and evaluation, now in staff position. Desires independent, will consider gas processing, prefer opportunity in refining or petrochemicals. Box K-143, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL FORMS

KRAFTBILT FORMS, designed especially for the oil industry, are popular because they are efficient, economical. For plat sheets, well log strips, columnar pads, all production reporting forms, material transfers, truck reports, all administrative forms, ask for new catalog 1154-K, Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Okla.

BUSINESS SERVICE

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LeTourneau Announces Four New Distributors

Four new distributors for industrial hoists and jib cranes have been announced by R. G. LeTourneau, Inc., of Longview, Tex. The new distributors are: Benkart Steel & Supply Co., Coraopolis, Pa.; John J. Connell Co., Inc., St. Louis, Mo.; Hallidie Machinery Co., with main office at Seattle, Wash., and branches in Portland, Ore., and Spokane, Wash.; William H. Ziegler Co., Inc., Minneapolis, Minn.

R. L. LeTourneau, vice president of the 28-year-old firm, said the appointments are part of a current expansion program in the company's industrial equipment division. The firm, which has produced industrial equipment for a number of years, recently announced improved lines of hoists and self-supporting jib cranes.

Beaird's Compressor Division Adds Engineers

Billy D. Case and James G. Hudnall have been appointed sales engineer and service engineer, respectively, by J. B. Beaird Co., Inc., Shreveport, La., W. W. Sentell, manager of general products division sales, has announced.

Cass, new sales engineer for packaged compressors and plant storage vessels, will cover the territory from Tulsa to Denver. He has been with Monarch Heating Corp. in Tulsa for the past 2 years.

Hudnall, who has joined Beaird as compressor service engineer, will be based in Shreveport. He formerly was with Union Carbide & Carbon Chemicals in Texas City as chief operator in the gas department for 8 years.

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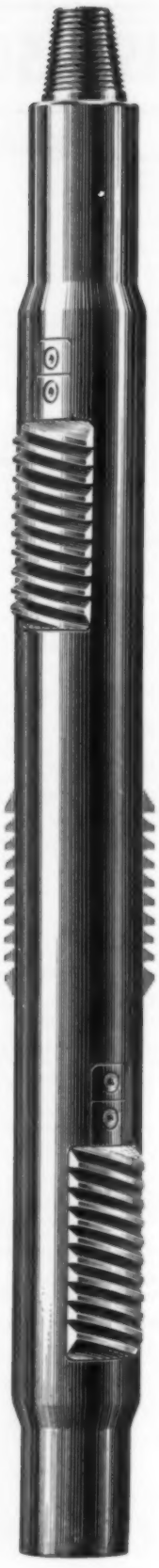
LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. Notice is hereby given that 78.14 acres of land within the known geologic structure of the Madison Township Field, undefined, Licking County, Ohio, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.S.T. May 1, 1957 when bids will be opened. Details of the lease offering, description of the land, how and where to submit bids, and bid forms may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D. C., H. K. Scholl, Manager.



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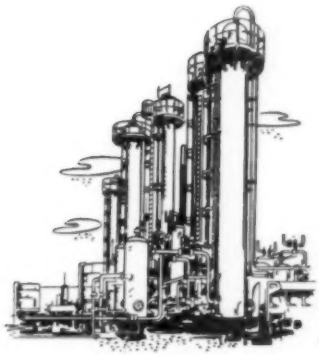

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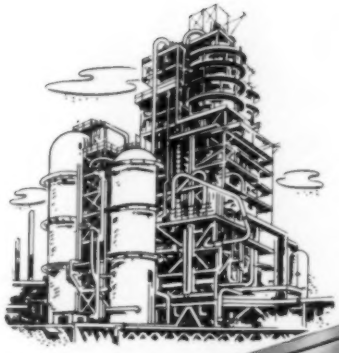

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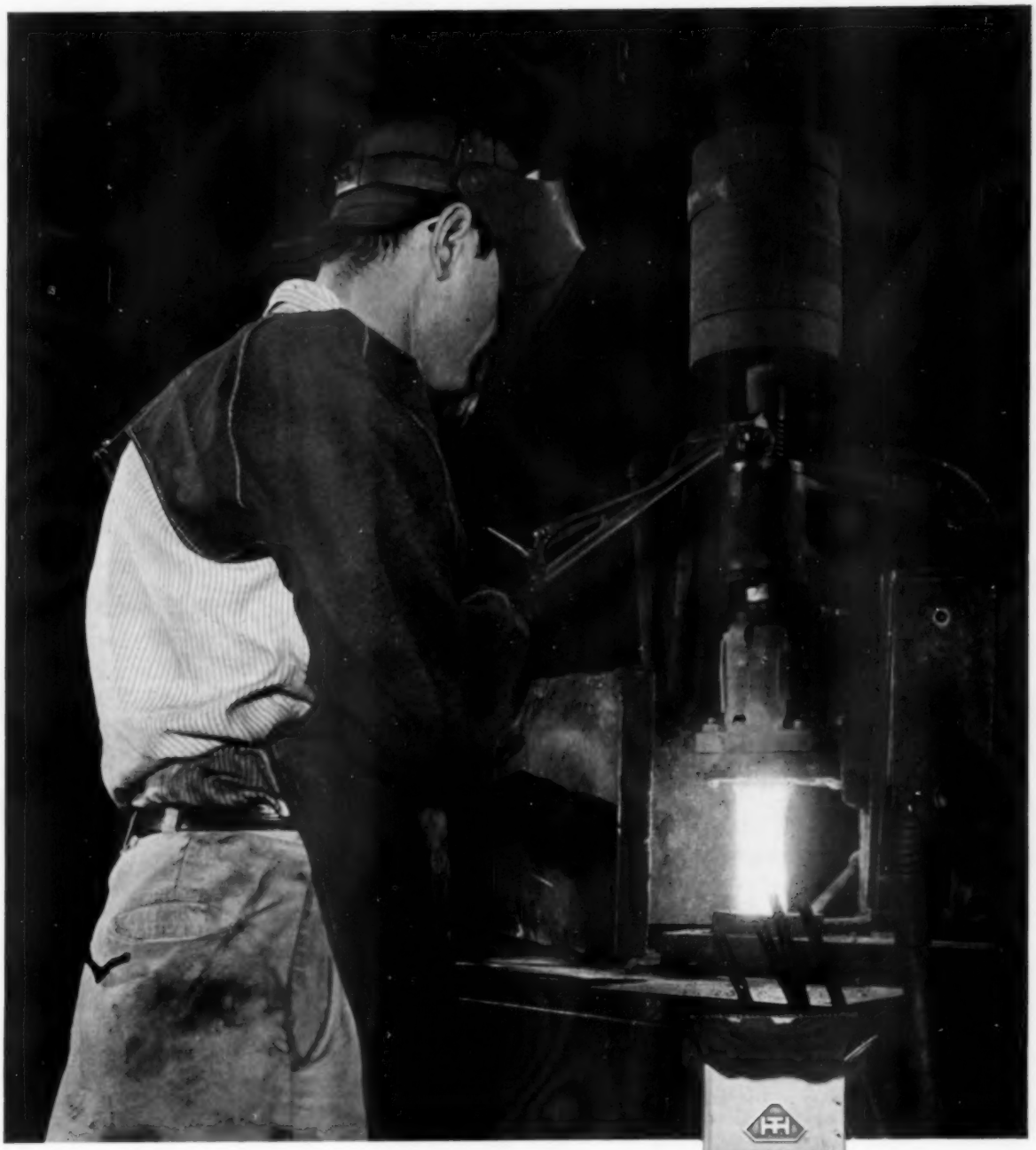

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